Total No. of Questions : 12]

SEAT No. :

P1048

[Total No. of Pages : 4

[4163] - 205
T.E. (Civil)
ADVANCED SURVEYING
(2008 Pattern) (Sem. - II)

Time :3 Hours] *[Max. Marks :100*

Instructions to candidates:-

1) ***Solve Q. 1 or Q.2, Q. 3 or Q. 4, Q. 5 or Q. 6 from section I and Q. 7 or Q. 8, Q. 9 or Q. 10, Q. 11 or Q. 12 from section II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic table electronic pocket calculator and steam table is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What is meant by side equation? State the equations of condition which must be satisfied in the adjustment of a geodetic quadrilateral without central station. **[8]**

b) What is GPS? State and explain various components of GPS. **[5]**

c) What are the various points to be considered for selection of a triangulation station? **[5]**

OR

Q2) a) The altitudes of two proposed stations A and B, 100 km apart, are respectively 420 m and 700 m. The intervening obstruction situated at C, 70 km from A has an elevation of 478 m. Ascertain if A and B are intervisible, and if necessary, find by how much B should be raised so that the line of sight must nowhere be less than 3 m above the surface of the ground. **[8]**

b) What are the various potential error sources that affect the GPS signal or result? **[5]**

c) Differentiate between Absolute positioning and Relative positioning. **[5]**

Q3) a) Explain the following terms : **[5]**

i) True Value
ii) True error
iii) Most probable value
iv) Residual error
v) Conditioned equation

P.T.O.

b) Explain with neat sketch, spherical excess. **[5]**

c) The angles of a triangle ABC were recorded as follows : **[6]**

A = 77° 14' 20" weight 4

B = 49° 40' 35" weight 3

C = 53° 04' 52" weight 2

Give the corrected values of the angles.

OR

Q4) a) What do you mean by weight of an observation? State the rules of assigning weight to the field observations. **[5]**

b) Explain the following terms : **[5]**

i) Independent quantity

ii) Direct observation

iii) Indirect observation

iv) Weight of an observation

v) Mistake

c) The following are the observed values of an angle : **[6]**

Angle	Weight
40° 20' 20"	2
40° 20' 18"	2
40° 20' 19"	3

Find :

i) p.e. of single observation of unit weight.

ii) p.e. of weighted arithmetic mean.

iii) p.e. of single observation of weight 3.

Q5) a) The following reciprocal observations were made from two points P and Q : **[10]**

Horizontal distance between P and Q = 6996 m

Angle of elevation of Q at P = 1°56' 10"

Angle of depression of P at Q = 1°56' 52"

Height of signal at P = 4.07 m

Height of signal at Q = 3.87 m

Height of instrument at P = 1.27 m

Height of instrument at Q = 1.48 m

Find the difference in level between P and Q and the refraction correction. Take Rsin 1" = 30.88 m.

b) Explain with a neat sketch how the alignment of tunnel is transferred from surface to the underground. **[6]**

OR

Q6) a) Find the difference of levels of the points P and Q and the R.L. of P from the following data : **[10]**

Horizontal distance between P and Q	= 7118 m
Angle of depression to P at Q	= 1°32' 12"
Height of signal at P	= 3.87 m
Height of instrument at Q	= 1.27 m
Co-efficient of refraction	= 0.07
R.L. of Q	= 417.860 m

Take Rsin 1" = 30.88 m

b) Describe in brief the location survey of a long bridge. **[6]**

SECTION - II

Q7) a) State giving reasons whether the statements are True or False. **[6]**

i) An oblique photograph is Unintentionally titled.

ii) Principal point of the photograph is affected by relief displacement.

iii) On an aerial photo, scale of every point is same.

iv) Triple overlap in the longitudinal direction is necessary in aerial photogrammetry for three successive photographs.

b) Determine the focal length of the camera lens, from the following observations taken with photo - theodolite kept of point O and observation are taken to the two objects A and B, the horizontal angle AOB being 25° 30^1. The 'X' co-ordinates of the objects appearing on the photographs are 60 mm and 30 mm respectively. **[6]**

c) Distinguish between terrestial and aerial photogrammetry. Under what circumstances you will recommend them. **[6]**

OR

Q8) a) Given different points of comparision between aerial photograph and Map. **[6]**

b) State the component parts of a phototheodolite and also mention the functions of each. **[6]**

c) In a pair of over lapping photographs the mean distance between principal points, both of which lie on the datum, is 6.5 cm. At the time of photography, the aircraft was 800 m above the datum. The camera has a focal length of 150 mm. In the common overlap a tower 125 m high with its axis at datum level is observed. Determine the difference of parallex of the top and bottom of tower. **[6]**

Q9) a) Define remote sensing Mention advantages and limitations of remote sensing. **[6]**

b) Enlist various GIS softwares and discuss in brief features of any one software. **[6]**

c) Discuss in brief various applications of GIS in civil engineering. **[4]**

OR

Q10)a) Discuss regarding the linkage of GIS to remote sensing. **[6]**

b) What makes data spatial? State difference between vector and raster data. **[6]**

c) Explain various components of GPS. **[4]**

Q11)a) What do you mean by sounding? What are different purposes of sounding? Explain any one method of locating sounding. **[8]**

b) Explain in detail the procedure of measurement of horizontal angle between two objects using Nautical sextent. **[6]**

c) Enlist different types of tidal gauges. **[2]**

OR

Q12)a) Derive an expression for solving three point problem by analytical method. **[8]**

b) How you will locate soundings by using GPS? Explain. **[6]**

c) What is Index error? How it is determined. **[2]**

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Total No. of Questions : 12]

SEAT No. :

P1584

[Total No. of Pages : 3

[4163] - 223
T.E. (Mechanical Sandwich)
WELDING TECHNOLOGY
(2008 Pattern) (Sem. - I) (Elective - I)

Time :3 Hours] *[Max. Marks :100*

Instructions to candidates:-

1) ***Answer three questions from section I and three questions from Section II.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Briefly explain the application of different flames used in gas welding. **[8]**

b) With neat sketch explain the working of single stage pressure regulator. **[8]**

OR

Q2) a) Why manifold system is required? What precautions have to be taken while designing a manifold system for fuel gas? **[7]**

b) How the following factors affect the mild steel welds? **[9]**

i) Torch tip size

ii) Torch angle

iii) Welding rod size

Q3) a) What is the effect of following parameters on welding in arc welding **[2]**

i) too high or too low current setting,

ii) arc length

b) Explain GMAW with neat sketch mention its application and advantages. **[8]**

c) Explain the principle of Plasma arc welding. Also mention the difference between non-transferred arc and transferred arc in PAW. **[8]**

OR

P.T.O.

Q4) a) Distinguish between consumable and non-consumable electrodes. **[4]**

b) Explain principle of flux cored arc welding with neat sketch also list advantages, disadvantages and application. **[8]**

c) Write a note on submerged arc welding. **[6]**

Q5) a) What is the function of timer built in spot welding machine? Briefly explain types of spot welding machine. **[8]**

b) Distinguish between upset welding and percussion welding. **[8]**

OR

Q6) a) Write down the basic steps involve in flash welding mentioning its application and Limitations. **[8]**

b) How resistance projection welding is different from the spot welding? Also mention the factors that affects the projection welding controlling parameters. **[8]**

SECTION - II

Q7) a) Sketch and describe the welding gun of electron beam welding. Also list EBW application. **[8]**

b) Where will you recommend the LBW as compared to EBW? **[5]**

c) What is the difference between cold welding and forge welding? **[5]**

OR

Q8) Write short note on : **[18]**

a) Friction and inertia welding,

b) Ultrasonic welding.

c) Solid state welding.

Q9) a) What are the advantages of soldering and brazing as compared to other welding processes. **[6]**

b) Write a note on dip soldering and brazing method also mention its advantages. **[10]**

OR

Q10)a) Write a note on furnace soldering and brazing method also mention its advantages **[8]**

b) Write a note on types of adhesives. **[8]**

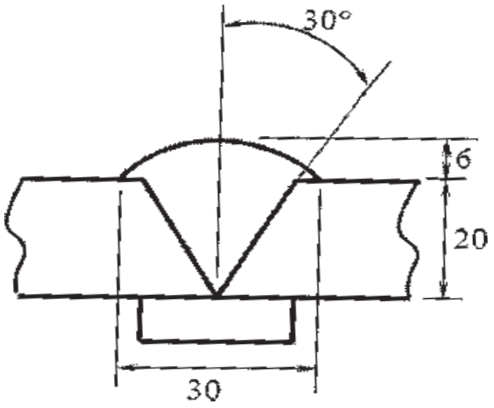
Q11)a) What are the causes that leads to incomplete fusion, undercut, underfill & spatter? **[8]**

b) What are the factors to be considered for weld quality? **[8]**

OR

Q12)a) What is the basic costing procedure for gas welding? **[6]**

b) Calculate the cost of welding the joint shown in fig. below of length 250 mm, the data available is density of the filling material is 7.85 gm/cm^3, deposition rate/hr = 300 gm, labor cost/hr = Rs. 500, electrode cost/gm = Rs. 20, operating factor = 45%, and deposition efficiency = 70%. **[10]**



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Total No. of Questions : 12]

SEAT No. :

P1587

[Total No. of Pages : 3

[4163] - 282

T.E. (Instrumentation and Control)

EMBEDDED SYSTEM DESIGN

(2008 Pattern) (Sem. - I)

Time :3 Hours] *[Max. Marks :100*

Instructions to candidates:-

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) With the help of neat diagrams, explain the interfacing of external program and data memory to 8051. **[8]**

b) Explain the role of the following pins of 8051 when configuring timer/ counter block as counter and timer. **[8]**

i) XTAL1 and XTAL2

ii) T0 or T1

OR

Q2) a) Explain the role of stack memory in calling subroutines and servicing interrupt service routines. **[8]**

b) Explain the interrupt structure of 8051. What are the vector addresses of all the interrupts? How is the priority of interrupts decided? **[8]**

Q3) a) What are the different addressing modes in 8051? Give examples of each. **[10]**

b) Calculate the time required to execute the following delay subroutine if f_{osc} = 6MHz. **[8]**

```
        MOV R6, # 20H
LOOP:   MOV R7, # 0F0H
LOOP1:  DJNZ R7, LOOP1
        DJNZ R6, LOOP
        RET
```

Show all the calculations in detail.

OR

P.T.O.

Q4) a) Write a program to configure timers of 8051 to generate a delay of 65ms. Assume f_{osc} = 12 MHz. Explain all the SFRs used. Explain calculations if any. **[10]**

b) Explain the following instructions of 8051: **[8]**

i) JBC 1Ah, label

ii) CJNE A, 42h, label

iii) SWAP A

iv) MOV 3Fh, #0F1h

Q5) a) With a neat diagram, explain the interfacing of 4 × 4 matrix keyboard to 8051. Also draw a flowchart to explain the logic used for detection of key presses. **[8]**

b) With a neat sketch explain the interfacing of 8 bit parallel ADC to 8051. **[8]**

OR

Q6) A stepper motor is to be interfaced to 8051.

a) Draw a neat interfacing diagram for the same. **[8]**

b) Write a program to drive the motor continuously, in clock wise direction for 5 rotations and anti clockwise direction for 5 rotations consecutively. Assume full step sequence. **[8]**

SECTION - II

Q7) a) Explain Timer 0 operation of AVR microcontrollers. **[8]**

b) Write the important architectural features of ATMega 8535. **[8]**

OR

Q8) a) What is the function of UDR (USART I/O Data Register) in AVR microcontroller? How is transmission or reception complete indicated by AVR microcontrollers during serial communication? **[8]**

b) The Timer/ Counter Interrupt Flag Register of ATTiny 2313 is shown below. Explain the bits of this register. **[8]**

7	6	5	4	3	2	1	0	
TOV1	OCF1A	OCF1B	–	ICF1	OCF0B	TOV0	OCF0A	TIFR
R/W	R/W	R/W	R	R/W	R/W	R/W	R/W	
0	0	0	0	0	0	0	0	

Q9) a) Write a program for AVR ATTiny 2313, to complement the port B after every 1 second. Assume internal clock of 1 MHz. **[8]**

b) Explain the addressing modes of AVR microcontrollers giving examples from the instruction set. **[8]**

OR

Q10)a) Explain the following instructions of AVR microcontrollers: **[8]**

i) SUBI Rd,k

ii) BRCC k

iii) CLR Rd

iv) OUT P,Rd

b) Ten unsigned eight bit numbers are stored from 70h onwards in the internal SRAM of ATTiny 2313. Write a program to add these numbers and store the result at 61h (Lower byte) and 62h (Higher byte). **[8]**

Q11)An AVR based temperature control system is to be designed with the control action as on-off. The heater is turned on and off with a relay. The sensor used for temperature measurement is Pt 100. The system is user friendly and has a 4 × 2 keys keyboard. It also shows the messages of "Heater On" and "Heater OFF" on a 16 × 2 LCD Display. Use internal ADC for temperature signal. Draw the scheme in detail covering the following points:

a) Block Diagram **[4]**

b) Port pin assignment **[2]**

c) Relay Interfacing for heater on off. **[4]**

d) Keyboard interfacing **[4]**

e) LCD interfacing. **[4]**

OR

Q12)a) With a neat schematic, explain the interfacing of RTC to AVR microcontroller. **[8]**

b) With a neat diagram explain the interfacing of Serial EEPROM to the AVR microcontroller. Consider the memory to be SPI enabled. Also show the important signals used. **[10]**

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Total No. of Questions : 12]

SEAT No. :

P1588

[Total No. of Pages : 3

[4163] - 283
T.E. (Instrumentation and Control)
CONTROL SYSTEM COMPONENTS
(2008 Pattern) (Sem. - I)

Time :3 Hours] *[Max. Marks :100*

Instructions to candidates:-

1) ***Answer three questions from section I and three question from Section II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain with neat sketch the working of Electro-Mechanical Relay (EMR) & write 4 technical specifications for the same. **[8]**

b) Draw the symbolic representation and Give any 2 practical applications of the following types of switches in process industry. **[10]**

i) Pressure switch
ii) Level switch
iii) Flow switch
iv) Rotary switch
v) Temperature switch

OR

Q2) a) What are the advantages & limitations of Solid State Relays (SSR) over EMR (min 8 points) **[8]**

b) List 4 types of contactors. Draw and explain working of any one type of contactor. Give its 4 technical specifications. **[10]**

Q3) a) Explain the overload protection circuit in Mixer grinder. Draw the electrical wiring diagram. **[8]**

b) List any 3 types of starters and draw using standard symbols electrical wiring diagram for Direct online starter. **[8]**

OR

P.T.O.

Q4) a) What are interlocks? Explain various interlocks in the lift application with wiring diagram. **[8]**

b) Draw and explain in details Reversing direction of motor rotation using standard symbols. **[8]**

Q5) a) State the necessity of FRL unit in Pneumatic System. Explain with a neat sketch working of an oil lubricator. **[8]**

b) Draw the Pneumatic circuit for the To & Fro motion of the piston (reciprocating motion) **[8]**

OR

Q6) a) Draw and Explain the Pneumatic Power supply with neat sketch. **[8]**

b) Draw and Write short notes on Pneumatic Time delay valves (On delay and off delay valve) **[8]**

SECTION - II

Q7) a) Compare hydraulic systems with Electrical system based on the following: **[10]**

i) Power developed

ii) Installation

iii) Economy

iv) Maintenance

v) Application

b) Write short notes & draw timing diagram for Hydraulic Time delay valve. **[8]**

OR

Q8) a) Draw a Pneumatic circuit for controlling cylinder A and cylinder B. The sequence is A + A - B+ B- . Use limit switch 1 and Limit switch 2 for cylinder motion control. Draw step displacement diagram. **[10]**

b) Explain Pneumatic Power supply with neat sketch. **[8]**

Q9) a) List various types of feeders. Explain with the help of neat sketch the working of any one type of feeder. **[8]**

b) Write 4 technical specifications of Fuse and circuit breaker. **[8]**

OR

Q10)a) Draw and explain fuse & circuit breaker. Write 1 application for each. **[8]**

b) Write short note on Fluidics. Give applications. **[8]**

Q11)a) Draw and explain 2 types of tube fittings. **[8]**

b) Explain intrinsic and explosion proof protection methods in detail. **[8]**

OR

Q12)a) Explain in detail hazardous area classifications. **[8]**

b) Draw and explain 2 types of pipe fittings. **[8]**

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Total No. of Questions : 12]

SEAT No. :

P1589

[Total No. of Pages : 3

[4163] - 284

T.E. (Instrumentation and Control)

ELECTRONICS INSTRUMENTATION

(2008 Pattern) (Sem. - I)

Time :3 Hours] *[Max. Marks :100*

Instructions to candidates:

1) ***Answer any three questions from each Section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, whenever necessary.***

SECTION - I

Q1) a) How RMS measurement takes place in typical Multimeter? Explain with neat block diagram. **[6]**

b) How passive components can be measured in LCR-meter? Also explain the "Q" concept in LCR-meter. **[6]**

c) Explain different types of measurements in DMM with neat diagram? **[6]**

OR

Q2) a) Explain the terms - RMS value and True RMS value. What is True RMS value of sine wave voltage of amplitude $V_P = 4\sqrt{2}$ V superimposed on a DC voltage of $V_{DC} = 3V$? **[10]**

b) Explain methods to measure unknown impedance using a Q meter? **[8]**

Q3) a) Describe following performance specifications of waveform generator: **[8]**

i) Frequency accuracy

ii) Amplitude accuracy

iii) Frequency stability

iv) Harmonic distortion

b) Why constant current source is required to generate triangular and square waveforms? Explain with neat diagram. **[8]**

OR

P.T.O.

Q4) a) With a suitable diagram explain the working of the sine wave converter in 8038. **[8]**

b) Explain sampled sine wave synthesizer with neat block diagram. **[8]**

Q5) a) What are the different features of DSO? Explain with the help of a neat block diagram. **[6]**

b) Explain the current probe and the 10:1 probe. **[6]**

c) Draw a neat labeled diagram of CRT in an oscilloscope. **[4]**

OR

Q6) a) Differentiate between the following : **[8]**

i) Analog storage oscilloscope and Digital storage oscilloscope.

ii) Dual Trace oscilloscope and Dual Beam oscilloscope.

b) Explain the Refresh mode and Pre-trigger mode in DSO. **[4]**

c) Explain what Z-modulation is and state its use. **[4]**

SECTION - II

Q7) a) Explain the ADC with Good Resolution, Good Accuracy and High Operating Speed with neat diagram? **[8]**

b) Where Voltage to Frequency conversion required? Explain the concept with neat diagram. **[10]**

OR

Q8) a) State and justify which type of ADC is used in Digital Multimeter and Digital Storage Oscilloscope. **[8]**

b) Explain the following with suitable diagrams : **[10]**

i) R-2R ladder with example

ii) Dual slope type ADC

Q9) a) Describe the following modes of universal counter : **[8]**

i) Totalizing

ii) Time interval

iii) Ratio mode

iv) Period

b) A digital frequency meter has a time base derived from a 1 MHz clock generator, frequency divided by decade counters. Determine : **[8]**

i) The measured frequency when a 1.512 kHz sine wave is applied and the time base uses six decade counters.

ii) The final output frequency from frequency divider system above if the six decade counters are replaced by scale of 16 - counter.

OR

Q10)a) State the different sources of error in digital instruments. Explain any two in detail. **[8]**

b) State significance of $3\frac{3}{4}$, $3\frac{7}{4}$ and $5\frac{1}{2}$ digits in digital multimeter. **[8]**

Q11)a) What is mean by Virtual Instrumentation? Describe the importance of Labview with example in Instrumentation. **[8]**

b) Explain the concept of Harmonic Distortion? Also explain Fundamental-Suppression Harmonic Distortion Analyzer with neat black diagram. **[8]**

OR

Q12)a) What is a Distortion meter? State its necessity. Explain Distortion meter with the bridge T network. **[8]**

b) Write short notes on : **[8]**

i) Spectrum Analyzer with swept frequency technique.

ii) Heterodyne wave analyzer.

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Total No. of Questions : 12]

SEAT No. :

P1591

[Total No. of Pages : 3

[4163] - 287

T.E. (Instrumentation and Control)

POWER PLANT INSTRUMENTATION

(2008 Pattern) (Sem. -II)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:-

1) ***Answers to the two sections should be written in separate books.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary.***
5) ***All questions are compulsory.***

SECTION - I

Q1) a) What is the necessity of Leaching & Extraction type Unit Operations? With the help of neat sketch explain Liquid-Liquid extraction process in detail. **[10]**

b) With the help of neat sketch explain Gas Absorption in detail. **[6]**

OR

Q2) a) What are the differences between Distillation and Extraction? Explain both with suitable applications. **[8]**

b) What are unit operations? Give the detailed classification of unit operations. Explain spray dryer in detail. **[8]**

Q3) a) Derive overall energy balance equation for heat exchanger. Also explain importance of LMTD. **[10]**

b) Explain Fluidized Bed Dryer with neat sketch. **[8]**

OR

Q4) a) With neat sketch explain fractionators and derive the operating line equation for it. **[10]**

b) Explain the various types of Filters used in Chemical Industry in detail. **[8]**

P.T.O.

Q5) a) Explain the factors affecting the selection of site for setting up the Wind Energy Power Plant. **[5]**

b) Explain Fission & Fusion in Nuclear Power Plant with suitable examples. **[6]**

c) Why power factor measurement in Power plant is necessary? Explain the scheme for measurement of the same. **[5]**

OR

Q6) a) Propose the scheme for measurement of Feed water flow measurement. Justify the sensor used. **[5]**

b) Explain the Need, and the Basic Principle of Smoke Density measurement? **[5]**

c) What is the purpose of measuring flue gas temperature in Thermal Power Plant? Draw P&I diagram for Boiler. **[6]**

SECTION - II

Q7) a) Discuss Burner Management System in Boiler. **[4]**

b) Enlist & Explain Different Boiler Interlocks. **[6]**

c) Draw and Explain Three-element Boiler feed water control system with schematic of electronic control system. **[8]**

OR

Q8) a) "Water tube boilers are most widely used in modern power plants", justify with suitable reasons. **[6]**

b) Explain Combustion control with neat sketch. **[8]**

c) What are the advantages gained by using economizer in modern power Plant? Discuss in brief. **[4]**

Q9) a) What are the factors affecting the Lubrication System in Turbine instrumentation? Discuss the lube oil characteristics required for tubine? **[8]**

b) What are the six categories of Turbine Instrumentation? Explain supervisory Instrumentation in Detail. **[8]**

OR

Q10)a) Suggest the Suitable temperature transduser for the following locations in Turbine. Justify your answer. Also Specify approximate range of Temperature. **[8]**

i) Turbine Exhaust Temperature

ii) Measure the air temperature leaving the machine.

iii) Monitor the oil temperature in the bearings.

b) Explain the pollution Monitoring System used in Power plants. **[8]**

Q11)a) Explain Tidal Power Generation alongwith its advantages & limitations. **[8]**

b) Enlist different Non-Conventional Energy Sourses. Explain Different types of Collectors used in Solar Poer generation. **[8]**

OR

Q12)a) With a neat sketch explain Medium & High Temperature Cycle Solar Power plant. **[8]**

b) What are combined cycle power plants? What advantages does it offer over other power generation methods? Do they have any Limitations? Explain. **[8]**

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Total No. of Questions : 12]

SEAT No. :

P1592

[Total No. of Pages : 3

[4163] - 289

T.E. (Instrumentation and Control)

INSTRUMENTATION SYSTEMS DESIGN

(Common to 2003 & 2008 Course) (Sem. - II)

Time :3 Hours] *[Max. Marks :100*

Instructions to candidates:-

1) ***Answer 3 questions from Section I and 3 question from Section II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Why it is necessary to refer packaging standard while designing on instrument? Explain DIN standard. **[8]**

b) Describe briefly NEMA standard Also give brief introduction of type 1, 2 and 3. **[8]**

OR

Q2) a) What does first and second digit of IP rating indicates? Explain with suitable examples. **[8]**

b) Explain the interrelation of design of instrument, production of instrument and economics. **[8]**

Q3) a) Explain the term ergonomics. Also describe how the equipment design practices depend on working environmental factors. **[8]**

b) Prove that thermal noise is independent of composition of resistance and thermodynamic equilibrium. **[8]**

OR

Q4) a) Explain popcorn noise and flicker noise in terms of generation, noise voltage or current expression and ways to minimise it. **[8]**

b) Explain the electrostatic discharge (ESD) with reference to human body model. **[8]**

P.T.O.

Q5) a) Using the AD 620 IC design amplifier for the gain of 50 using supply voltage of $\pm$ 13V. Draw the circuit diagram for the amplifier. Specify output of above amplifier for input voltage of 2V. Also write down features of instrumentation amplifier. **[9]**

b) In an oven temperature varies between 0 to 500°C. It is desired that this temperature range is to be converted into 0 to 5V. Select the proper thermocouple and IC required for signal conditioning. Do the designing of circuit. Draw the circuit diagram. Also write down features of IC used for the design. **[9]**

OR

Q6) a) Design the temperature transmitter for the following : **[9]**

i) The output coming from sensor and its signal conditioning unit is 0 – 5V for temperature range of 0 to 100°C.

ii) The output of transmitter is 4 – 20mA.

Draw the circuit diagram. Also enlist features of IC used.

b) Explain how AD 595 IC can be used as standalone celsius thermometer. **[9]**

SECTION - II

Q7) a) Design the digital frequency counter for frequency range of 10 kHz using IC 7217. **[9]**

b) In an oven temperature varies from 0 to 200°C. Sensor and its signal conditioning unit is already available. It produces 0 to 2V for above said temperature range. It is desired to design digital temperature indicator (Digital Panel Meter) to indicate temperature digitally on $3\frac{1}{2}$ digit display. Select the proper IC and complete design with circuit diagram. **[9]**

OR

Q8) a) A electromechanical relay is to be interfaced to MCT2E IC Relay has 2.5 k Ω resistance and require 5V for its energization. The CTR of the MCT2E is 0.5. Draw the interfacing diagram and explain the working. **[9]**

b) It is desired to interface CMOS based microcontroller to a stepper motor. Select the proper IC to achieve the interfacing. Draw the complete circuit diagram. Also list the features of IC used in the design. **[9]**

Q9) a) Explain the importance of etch factor overhang for precise PCBs. **[8]**

b) Why PCB should have proper value of wave impedance "ZW". Also explain Reflection problem arising due to unproper design of digital PCB. **[8]**

OR

Q10)a) What are advantages and disadvantages of "Solder mask". **[8]**

b) CMOS is much less sensitive than TTL to disturbance and it is not necessary for CMOS circuits to keep signal lines near to ground lines. Explain this statement. **[8]**

Q11)a) Explain the terms availability & maintainability. **[8]**

b) Explain the failure rate curve and different failure modes on it. **[8]**

OR

Q12)a) Highlight the role of documentation in any product life cycle. Also briefly explain the different types of document that are part of any instrument. **[8]**

b) Differentiate clearly between reliability & quality of product. **[8]**

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Total No. of Questions : 12]

SEAT No. :

P1150

[Total No. of Pages : 2

[4163] - 356
T.E. (Information Technology)
MANAGEMENT INFORMATION SYSTEMS
(2008 Pattern) (Sem. - II)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates :-

1) ***Answer any 3 questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What is need of information system in an organization? Explain resources of an information system. **[9]**

b) Illustrate the detailed use of operation support system in an organization. **[9]**

OR

Q2) a) Define MIS. Explain different roles of MIS with suitable examples. **[9]**

b) Explain planning function of an organization with the help of its various dimensions. **[9]**

Q3) a) Explain the concept of DSS in-order to help an organizational decision making. **[8]**

b) List and explain different analytical modeling activities needed in DSS. **[8]**

OR

Q4) a) Explain the term data warehouse. How it is useful in organizational decision making? **[8]**

b) Explain the working of Knowledge based expert system. Give its applications. **[8]**

Q5) a) List and explain essential components of e-commerce process. **[12]**

b) E-commerce has a broader Scope in current business trends, justify? **[4]**

OR

P.T.O.

Q6) a) How CRM system works in different phases? **[8]**

b) Explain the challenges and trends in supply chain management. **[8]**

SECTION - II

Q7) a) What type of information is needed by HR manager of a software industry? Which are the reports needed by the management for record and analysis purpose? **[9]**

b) Explain how MIS is useful in accounting and finance management. **[9]**

OR

Q8) a) Illustrate the importance of service industry. How MIS helps in service industry like banking to give better services to customers. **[9]**

b) Explain Enterprise Application Integration (EAI). How EAI software can integrate front-office and back-office applications of e-business. **[9]**

Q9) a) Define Enterprise Management System (EMS). What are its components? **[8]**

b) Explain tangible and intangible benefits of ERP with suitable examples. **[8]**

OR

Q10)a) Explain challenges in BPO with respect to current scenario. **[8]**

b) What is ITES? What is required to setup ITES in an organization? **[8]**

Q11)a) What are ethical responsibilities of computer professionals? **[8]**

b) What are the health issues in the use of information technology? **[8]**

OR

Q12)a) What is biometric security? Give its benefits over traditional security methods with suitable example. **[8]**

b) What is Global IT management? List and explain challenges involved in it **[8]**

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Total No. of Questions : 12]

SEAT No. :

P1151

[Total No. of Pages : 2

[4163] - 357
T.E. (Information Technology)
PROGRAMMING PARADIGMS
(2008 Pattern) (Sem. - II)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates :

1) ***Answers to the two sections should be written in separate books.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) State and explain any five influencing factors which plays major role in programming languages? **[10]**

b) What are the feasible cost measures in cost evaluation of programming language? **[8]**

OR

Q2) a) Explain Orthogonality a good attribute of programming language. **[4]**

b) Compare Translators and Software-Simulated Computers. **[6]**

c) What is binding? Describe the binding time at execution and translation. **[8]**

Q3) a) Explain any two parameter passing methods with example. **[8]**

b) Explain and compare Programme-controlled and System-controlled Storage management. **[8]**

OR

Q4) a) Explain the concept of Prime programs. **[6]**

b) Explain with example garbage collection in LISP. How the reference count technique helps to recover the memory. **[10]**

Q5) a) State and explain the desirable characteristics for object-oriented programming model? **[10]**

b) Define messages in object-oriented system. Explain three categories of messages. **[6]**

OR

P.T.O.

Q6) a) Explain with example the structure of thread class and its client class. **[4]**

b) State methods used in the thread class. **[4]**

c) Write the features not supported by JAVA but supported by C++. (any 8 points) **[8]**

SECTION - II

Q7) a) Draw a cell diagram of list ((ab) (c) (d f)). **[4]**

b) Write output for **[4]**

- append ('(A B) C) '(D (E F))
- (+(car (cdr (list 2 3))) 4)

c) Write features of logic programming language model. **[10]**

OR

Q8) a) Explain the two approaches used to prove the Goal in Prolog system. **[8]**

b) Write short note on Lambda Calculus. **[5]**

c) Write the mathematical properties of functional programming language. **[5]**

Q9) a) State and explain five different types of dependencies in the process of analysis of parallelism. **[10]**

b) Explain the principle of parallel programming language. **[6]**

OR

Q10)a) Describe three basic organizations used in the design of multiprocessor operating systems. **[8]**

b) Explain message passing versus shared address space. **[8]**

Q11)a) Describe design principles of Data flow Programming. **[8]**

b) State and explain the components of SQL as a Database Programming language. **[8]**

OR

Q12)a) What is socket? State different socket primitives. **[6]**

b) Explain different types of socket used in network programming. **[6]**

c) Explain the components of URL with example. **[4]**

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Total No. of Questions : 12]

SEAT No. :

P1152

[Total No. of Pages : 4

[4163] - 358
T.E. (Information Technology)
DESIGN AND ANALYSIS OF ALGORITHMS
(2008 Pattern) (Sem. - II)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates :-

1) ***Answer any 3 questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Find out the time complexity for the recurrence equation as follows: **[10]**

i) $T(n) = T(n/2) + 1$

ii) $T(n) = 2T(n/2) + n$

Also explain the above equations belongs to which searching/ sorting algorithms.

b) Write an algorithm to delete an element from a linked list. Also mention the worst case running time for this operation. **[8]**

OR

Q2) a) Consider the following algorithm **[12]**

```
ALGORITHM sum (n)
// Input : A non-negative integer n
S←o      /
for i = l to n do
      s ← s + i
return s.
```

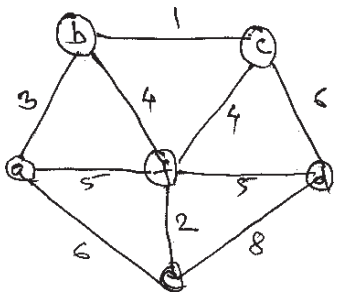
i) What does this algorithm computes?
ii) What is its basic operation?
iii) How many times the basic operations executed?
iv) What is the efficiency class of this algorithm?
v) Suggest an improved algorithm and indicate its efficiency class. If you cannot do it, try to prove that it cannot be done.

b) Setup and solve a Recurrence relation for the number of calls made by F(n), the recursive algorithms for computing n! **[6]**

P.T.O.

Q3) a) Explain the upper and lower hulls in the convex hull problem with an example. **[8]**

b) Analyze PRIMS algorithm of minimum spanning tree using greedy approach. Find the cost of minimum spanning tree of the give graph by using prims algorithm. **[8]**



OR

Q4) a) Find out minimum cost spanning tree using KRUSKAL algorithm. **[8]**

Edge	Cost	Edge	Cost
(V_1,V_7)	1	(V_4,V_5)	7
(V_3,V_4)	3	(V_1,V_2)	20
(V_2,V_7)	4	(V_1,V_6)	23
(V_3,V_7)	9	(V_5,V_7)	25
(V_2,V_3)	15	(V_5,V_6)	28
(V_4,V_7)	16	(V_6,V_7)	36

b) Construct the Huffman tree for the following data and obtain its Huffman code. **[8]**

Character	A	B	C	D	E	–
Probability	0.5	0.35	0.5	0.1	0.4	0.2

Encode text DAD-BE using the above code.

Decode the text 1100110110 using above information.

Q5) a) Compare matrix generation for warshalls algorithm and floyds algorithm with suitable examples. **[8]**

b) Conside the knapsack problem : n = 3, $(W_1, W_2, W_3) = (2, 3, 4)$ $(P_1, P_2, P_3) = (1, 2, 5)$ and m = 6. Solve the problem using dynamic programming approach. **[8]**

OR

Q6) What is dynamic programming approach? Solve the following problem using dynamic approach. **[16]**

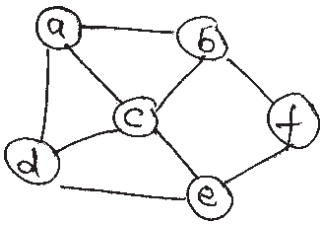
N = 4 and (a_1, a_2, a_3, a_4) = (do, if, int, while)

P(1:4) = (3, 3, 1, 1) and q(0, 4) = (2, 3, 1, 1, 1)

Compute and construct OBST for above value using Dynamic approach.

SECTION - II

Q7) a) Find the Hamitonion cycle by using backtracking approach for given graph. **[8]**



b) Find all possible solutions for five queen problem using backtracking approach. **[8]**

OR

Q8) Consider knapsack problem : n = 8, **[16]**

$(W_1, W_2, W_3, W_4, W_5, W_6, W_7, W_8)$ = (1, 11, 21, 23, 33, 43, 45, 55)

P = (11, 21, 31, 33, 43, 53, 55, 65), m = 110.

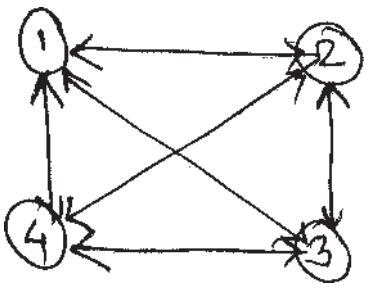
Solve the problem using backtracking approach.

Q9) a) What is LC search? How does it help in finding a solution for branch and bound algorithm. **[8]**

b) What is the differance between backtracking approach and branch and bound approach. Illustrate using 8 queens problem. **[8]**

OR

Q10) What is Travelling sales person problem? Find the solution of the following travelling salesperson problem using Dynamic approach and Branch & Bound approach. **[16]**



$$\begin{bmatrix} 0 & 10 & 15 & 20 \\ 5 & 0 & 9 & 10 \\ 6 & 13 & 0 & 12 \\ 8 & 8 & 9 & 0 \end{bmatrix}$$

Q11)a) Define NP-Hard and NP- Complete problems. Represent the relation between them. Prove that P is a subset of NP. **[8]**

b) Explain flow shop scheduling. Show that the Job sequencing with deadlines problem is NP-Hard. **[10]**

OR

Q12)a) Explain the cooks theorem in details with suitable example. **[8]**

b) Write short notes on : **[10]**

i) P and NP problems

ii) CNF- satisfability problem

iii) RSA - algorithm

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Total No. of Questions : 12]

SEAT No. :

P1585

[Total No. of Pages : 4

[4163] - 239
T.E. (Prod. / Prod. S/W)
NUMERICAL TECHNIQUES AND DATABASE
(2008 Pattern) (Sem. - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any one question from each unit.***
2) ***Answers to the two sections should be written in separate books***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Unit - I

Q1) a) Define the flowing in relation to DBMS **[10]**

i) Schema

ii) Instance

iii) Domain

iv) Attributes and its types

v) Data constraint

b) Explain with an example the following : **[8]**

i) Data Definition Language and Data Manipulation Language

ii) Logical and Physical data independence

OR

P.T.O.

Q2) a) Explain the following keys used in DBMS with an example : **[12]**

i) Super Key

ii) Candidate key

iii) Primary Key

iv) Foreign Key

b) Write short note on : **[6]**

i) Group by clause and

ii) Having clause in SQL

Unit - II

Q3) a) Explain any four aggregate functions used in SQL with an example. **[8]**

b) Explain the syntax of following SQL commands.

i) CREATE

ii) INSERT

iii) DROP TABLE

iv) DELETE **[8]**

OR

Q4) a) Explain various cardinality constraints in Entity Relationship model with an example. **[7]**

b) Write a SQL query to create the database 'Employee' with emp_no as primary key: Employee (emp_no, name, Age, skill, pay_rate). **[3]**

i) Insert any two records of your choice in Employee database. **[2]**

ii) Modify the Employee database by adding a the column as dept. **[2]**

iii) Is it possible to drop a 'skill' column in Employee database. Justify. **[2]**

Unit - III

Q5) a) Explain the following :

i) Intelligent agents.

ii) Global information systems. **[8]**

b) Describe any four of the pressures that characterize the modern global business environment and how the information technology can help to face these pressures. **[8]**

OR

Q6) a) Define Information systems. What are the basic components of Information system? **[8]**

b) Explain major technical and non technical limitations of EC. **[8]**

SECTION - II

Unit - IV

Q7) a) Explain the concept of significant digits . **[4]**

b) Draw a flow chart and write a C program for solving an algebraic equation using bisection method. **[8]**

c) Solve the following system of equations by Gauss Elimination method

$3X + 4Y + 5Z = 18$

$2X - Y + 8Z = 13$

$5X - 2Y + 7Z = 3$ **[6]**

OR

Q8) a) Write a Pseudo C-program for solving linear simultaneous equations by using Gauss elimination method? **[6]**

b) What do you mean by inherent errors and blunders in mathematical modeling. **[4]**

c) Find the root of $3x - \cos x - 1 = 0$ correct upto 6 decimal places by Newton Raphson method taking $x = 1$ as initial value of root. **[8]**

Unit - V

Q9) a) Find out value of X at Y = 13.5 using Lagrange's Interpolation formula. **[8]**

X:	93.0	96.2	100.0	104.2	108.7
Y:	11.38	12.08	14.07	17.07	19.91

b) Write C program for fitting a straight line Y = AX + B by Method of Moments. **[8]**

OR

Q10)a) From the following table of half yearly premium for policies maturing at different ages, estimate the premium for policy maturing at age 46 using Newton's Forward interpolation formula **[8]**

Age X:	45	50	55	60	65
Premium Y:	114.84	96.16	83.32	74.48	68.48

b) Fit a straight line to the following data using method of least square. **[8]**

X:	0	1	2	3	4
Y:	1	1.8	1.3	2.5	6.3

Unit - VI

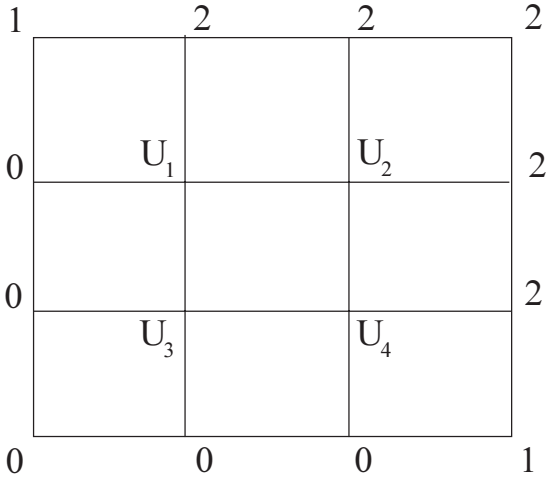
Q11)a) What do you mean by unconstraint and constraint optimization problem. Explain Lagranges Multiplier method to solve constraint optimization problem. **[8]**

b) Write a C-program for Runga Kutta method of fourth order. **[8]**

OR

Q12)a) Define optimization. Explain the process of formulation of an engineering optimization problem. **[8]**

b) Evaluate the functions u(x, y) satisfying $\frac{\partial^2 u}{\partial X^2}+\frac{\partial^2 u}{\partial Y^2}=0$, at the inside grid points given the boundary conditions as follows. Solve by iterative method upto four iterations. **[8]**



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Total No. of Questions : 12]

SEAT No. :

P1099

[Total No. of Pages : 4

[4163] - 271
T.E. (E & TC) (Sem. - I)
CONTROL SYSTEMS
(2008 Pattern)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer three questions from each section.***
2) ***Answers to the two sections should be written in separate answer sheets.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain open loop and closed loop control system with an example of each. **[8]**

b) Find the transfer function $X_2(s)/F(s)$ for the system shown in figure1. **[8]**

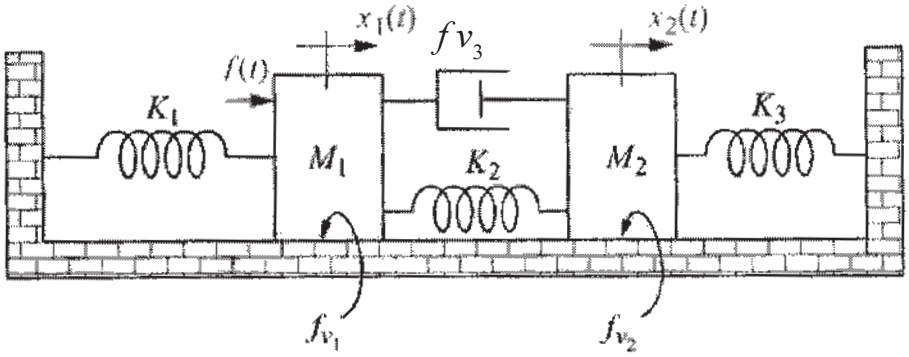

Fig.1

OR

Q2) a) Using Mason's rule find the transfer function, T(s) = C(s)/R(s), for the system represented in fig.2 **[8]**

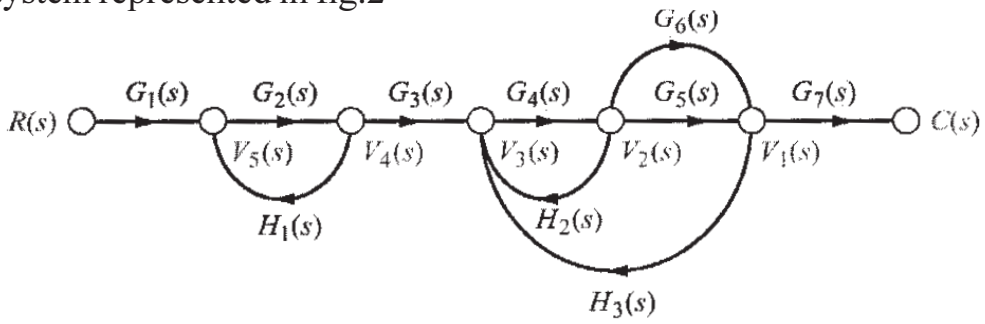

Fig.2

P.T.O.

b) Reduce the block diagram shown in figure 3 to a single block representing the transfer function, T(s) = C(s)/R(s) **[8]**

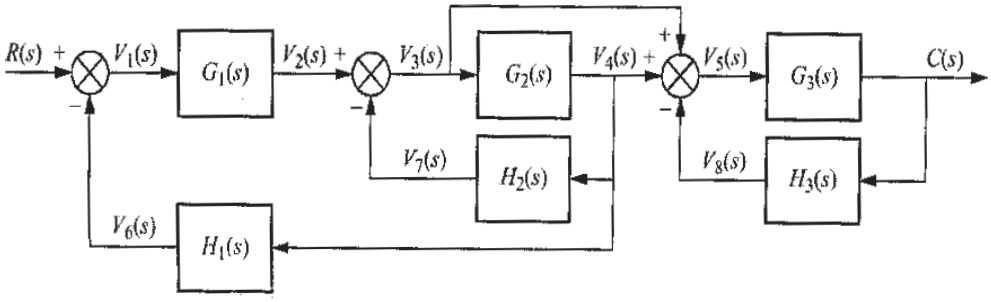

Fig. 3

Q3) a) A unity feedback system has the following forward transfer function:

$$G(s) = \frac{1000(s+8)}{(s+7)(s+9)}$$

Evaluate system type, Kp, Kv, Ka. Also find the steady state errors for the standard step, ramp and parabolic inputs. **[8]**

b) A second order system is given by $\frac{C(s)}{R(s)} = \frac{25}{s^2+6s+25}$. Find rise time, peak time, peak overshoot and settling time if subjected to unit step input. **[8]**

OR

Q4) a) Sketch the root locus for unity feedback system with open loop transfer function, $G(s) = \frac{k}{s(s^2+8s+32)}$. **[8]**

b) The open loop transfer function of the unity feedback system is

$$G(s) = \frac{200}{s(s^3+6s^2+11s+6)}.$$

Using Routh Criterion determine the stability of the system. **[8]**

Q5) a) The open loop transfer function of a unity feedback system is given by,

$$G(s) = \frac{k(s+20)}{(s+1)(s+2)(s+10)}$$

Construct bode plot for k = 10. Determine phase margin, gain margin, phase crossover frequency, gain crossover frequency. Comment on the stability of the system. **[12]**

b) State and explain any three frequency domain specifications. **[6]**

OR

Q6) a) The open loop transfer function of a unity feedback system is given by

$$G(s) = \frac{2(1-s)}{(s+2)(s+3)}.$$

Draw the Nyquist plot and hence find out whether the system is stable or not. **[12]**

b) State and explain Nyquist stability criterion. **[6]**

SECTION - II

Q7) a) For the circuit shown in figure 4, obtain state equations. **[8]**

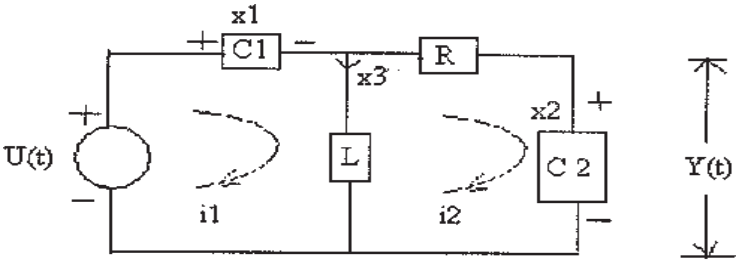

Fig.4

b) Consider a system having state model

$$\begin{bmatrix} \dot{x}1 \\ \dot{x}2 \end{bmatrix} = \begin{bmatrix} -2 & -3 \\ 4 & 2 \end{bmatrix} \begin{bmatrix} x1 \\ x2 \end{bmatrix} + \begin{bmatrix} 3 \\ 5 \end{bmatrix} u$$

$$Y(t) = \begin{bmatrix} 1 & 1 \end{bmatrix} \begin{bmatrix} x1 \\ x2 \end{bmatrix}.$$

Obtain its transfer function. **[8]**

OR

Q8) a) Find the state transition matrix for,

$$A = \begin{bmatrix} 0 & -1 \\ 2 & -3 \end{bmatrix}$$ **[8]**

b) A linear time invariant system is characterized by the state variable model. Comment on the controllability and observability of the system.

$$\begin{bmatrix} \dot{x}1 \\ \dot{x}2 \end{bmatrix} = \begin{bmatrix} -1 & 0 \\ 0 & -2 \end{bmatrix} \begin{bmatrix} x1 \\ x2 \end{bmatrix} + \begin{bmatrix} 0 \\ 1 \end{bmatrix} u(t)$$

$$Y(t) = \begin{bmatrix} 1 & 2 \end{bmatrix} \begin{bmatrix} x1 \\ x2 \end{bmatrix}$$ **[8]**

Q9) a) Draw and explain PLC architecture. Elaborate the need of PLC in modern industries. **[10]**

b) Explain P, PI and PD mode of PID controllers with their limitations. **[8]**

OR

Q10)a) Develop suitable ladder diagram for automatic bottle filling control. A control program will detect the position of bottle via a limit switch; fill the bottle until photo sensor detects the filled position. Then it will start the conveyor belt. **[10]**

b) Explain PID controller with block diagram. **[8]**

Q11)a) Explain digital control system with block diagram. **[8]**

b) Explain Missile launching and guidance system. **[8]**

OR

Q12)a) Draw and explain the block diagram of distributed control system. **[8]**

b) Explain a general architecture for the self tuning controllers in adaptive control. **[8]**

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Total No. of Questions : 12]

SEAT No. :

P1590

[Total No. of Pages : 4

[4163] - 286
T.E. (Instrumentation and Control)
DIGITAL SIGNAL PROCESSING FUNDAMENTALS
(Sem. - II) (2008 Patterm)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from each Section.***
2) ***Answer to the two Sections should be written in separate books***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Assume suitable data, if necessary.***
5) ***Use of electronic pocket calculator is allowed.***

SECTION - I

Q1) a) Define a Signal. Give the classification of signals with the help of neat sketches. **[8]**

b) State whether the given signals are energy or power signals. Justify the answer. **[8]**

i) $x(n)=(0.8)^n u(n)$.

ii) $x(n) = 3^n ; n<0$

OR

Q2) a) State and explain the properties of convolution. **[8]**

b) Determine the particular solution of the difference equation

$y(n) = 6y(n-1)-4y(n-2)+x(n)$

When the forcing function $x(n) = 3^n$; $n \geq 0$, and zero everywhere. **[8]**

Q3) a) The impulse response of the system is,

$$h(n) = \left(\frac{1}{2}\right)^n ; n = 0,1,2,3$$

$= 0$; *otherwise*

Find the response of the system of the step input. **[8]**

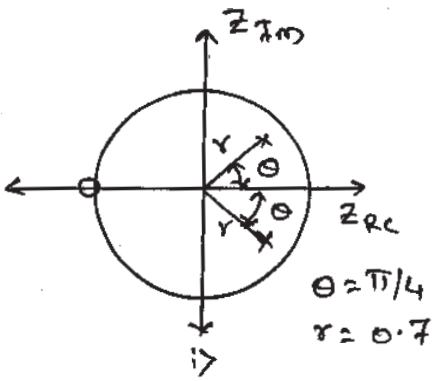
P.T.O.

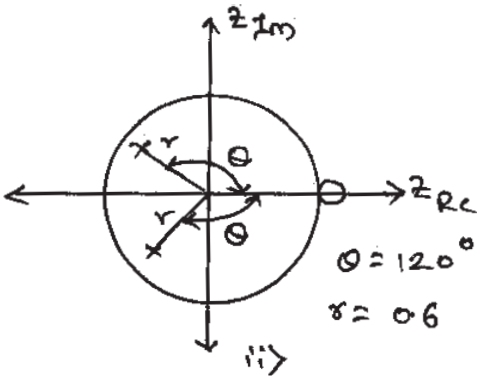
b) Find the magnitude response and the phase response at
$\omega=0,\omega=\pi,$ for the system with,

$$H(z)=\frac{1}{1-0.5z^{-1}}$$ **[8]**

OR

Q4) a) Obtain the transfer functions for the filters described by the following pole-zero diagrams and state the type of filter in each case. **[8]**





b) Find the response of the system described as , **[8]**

$$y(n)=\frac{5}{6}y(n-1)-\frac{1}{6}y(n-2)+x(n),$$ to the input signal,

$$x(n)=\delta(n)-\frac{1}{3}\delta(n-1)$$

Q5) a) The first five DFT's points of real and even sequence $x(n)$ of length are given below, **[4]**

X (k) = {6,2,0,1,2,.....},

Find remaining three points.

b) Distinguish between circular convolution and linear convolution. **[4]**

c) Find the DFT of a sequence, **[10]**

$x(n) = 0.5$; *for* $0 \le n \le 2$

$= 0$; *otherwise.*

For i) N = 4.

ii) N = 8.

OR

Q6) a) Explain the difference between FT, DTFT and DFT. **[4]**

b) Write short notes on overlap save and overlap add algorithms. **[8]**

c) Find the IDFT of the sequence, **[6]**

$X(k) = \{5+2j,-1,5-2j,0\}$

SECTION - II

Q7) a) Compute the IDFT of the sequence using DIT FFT algorithm, **[12]**

$X(k) = \{1,1+j,2,1-2j,0,1+2j,0,1-j\}$

b) What is FFT? Why FFT is needed. **[4]**

OR

Q8) a) What do you mean by zero padding? What is its purpose? **[4]**

b) Compute the 8- point DFT of the given sequence using DIF FFT Radix-2 algorithm. **[12]**

$x(n) = 1; 0 \le n \le 4$

Q9) a) Design and FIR filter approximating the ideal frequency response, **[12]**

$$H_d(e^{j\omega}) = e^{-j\alpha\omega};\ for |\omega| \le \frac{\pi}{6}$$

$$= 0;\ for \frac{\pi}{6} \le |\omega| \le \pi$$

Using Hanning window. Determine the filter coefficients for N=13.

b) Give the different methods for designing FIR filters . **[4]**

OR

Q10)a) State the properties of FIR filters? Explain why FIR filters are always stable. **[6]**

b) Design a linear phase FIR low pass filter of order seven with the cutoff frequency 1 rad/sec using hamming window. **[10]**

Q11)a) Design a digital Butterworth filter satisfying the constraints, **[14]**

$$0.707 \le \left|H(e^{j\omega})\right| \le 1;\ for\ 0 \le \omega \le \frac{\pi}{3}$$

$$\left|H(e^{j\omega})\right| \le 0.2;\ for\ \frac{3\pi}{4} \le \omega \le \pi$$

With T = 1 sec by using bilinear transformation method.

b) What is wrapping effect? What is its effect on magnitude and phase response? **[4]**

OR

Q12)a) Design a digital Chebyshev filter to meet the following constraints, **[16]**

Pass band attenuation = 2.5 dB.

Pass band frequency = 20 rad/sec.

Stop band attenuation = 30 dB.

Stop band frequency = 50 rad/sec.

Take T = 1 sec. use impulse invariance technique.

b) Sketch the frequency response of a Low Pass Butterworth filter. **[2]**

■■■

Total No. of Questions : 6]

SEAT No. :

P1594

[Total No. of Pages : 2

[4163] - 293
T.E. (Printing)
COLOUR MANAGEMENT & STANDARDIZATION
(2008 Pattern) (Sem. - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer to the two sections should be written in Separate books.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***

SECTION - I

Q1) Answer any two : **[18]**

a) Explain Additive Theory and Subtractive Theory.

b) Process colors cyan, magenta and yellow are used for printing instead of Red, Green and Blue. Explain this with reflection and absorption of color.

c) Explain the application of various rays presents in Electromagnetic spectrum.

Q2) Solve any two : **[16]**

a) What is CIE Standard Illuminant explain it with example.

b) Explain Color Matching Experiment.

c) Explain the term human vision deficiency.

Q3) Answer any two : **[16]**

a) What is color tolerance ellipse? Explain it for various colour spaces.

b) Calculate chromaticity co-ordinates for C and A Illuminants

c) Explain Munsell Color system.

P.T.O.

SECTION - II

Q4) Answer any two : **[18]**

a) Differentiate 45/0 and d/8 geometry.

b) Explain the various elements that are used in visual colour measurement

c) Write and explain various types of Spectrophotometer.

Q5) Answer any two : **[16]**

a) Explain ICC tags used in ICC profiles.

b) Write down various types of rendering intents used while profiling. Explain Perceptual rendering intent and their application.

c) Explain 'Scanner profiling' and how to apply scanner profile in Photoshop.

Q6) Solve any two : **[16]**

a) Write and explain the variables that need to control while standardizing Web Offset Printing press.

b) What is Gamut? Explain Gamut Mapping.

c) Write and explain various Quality control aids used for plate exposing and printing.

■■■

Total No. of Questions : 6]

SEAT No. :

P1597

[Total No. of Pages : 3

[4163] - 297
T.E. (Printing)
STATISTICAL PROCESS CONTROL
(2008 Pattern) (Sem. - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***Assume suitable data, if necessary.***
3) ***Answers to the two sections should be written in spearate books.***
4) ***Neat diagrams must be drawn wherever necessary.***
5) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) Explain the role of Control charting tool in SPC with examples. **[8]**

b) Explain the concept of Quality with reference to Detection Technique and Prevention Technique in detail with suitable example. **[8]**

OR

What is Process Mapping? And Process Flow charting? Also explain the importance of Process analysis in detail with the help of suitable example from printing industry.

Q2) Explain the various Histogram patterns in short with diagrams and its probable causes? **[16]**

OR

From the given data, arrange the data, prepare frequency distribution table and draw the Histogram only and comment on the same.

0.912	0.910	0.904	0.905	0.910	0.911
0.914	0.912	0.910	0.913	0.908	0.914
0.907	0.909	0.913	0.912	0.909	0.913
0.902	0.906	0.909	0.907	0.906	0.908
0.915	0.909	0.910	0.911	0.912	0.909
0.910	0.909	0.908	0.910	0.909	0.907

P.T.O.

Note 1 : From G Chart, the recommended number of groups should be 7 for Number of measurements between 30 to 40.

Note 2 : It was observed later on that the measuring instrument is having an error of + 0.003 measurement value.

Q3) a) Explain the classification of process variation in detail with examples. **[8]**

b) Explain the concept of Distribution of measurement data with reference to the characteristics of distribution. **[10]**

OR

a) Explain the following : **[18]**

i) Relationship between Mean, Median and Mode.

ii) Relationship between Range, Variance and Standard Deviation.

iii) Normal Distribution & 3SD spread.

SECTION - II

Q4) 4 Prepare X - MR chart from the given data. **[16]**

Sample No.	1	2	3	4	5	6	7	8	9	10
Measurements	.0218	.0243	.0232	.0256	.0247	.0255	.0282	.0261	.0244	.0252

Sample No.	11	12	13	14	15	16	17	18	19	20
Measurements	.0265	.0267	.0254	.0238	.0249	.0275	.0265	.0232	.0294	.0281

Note : Use n =2

Shewhart's Constants : E2 = 2.659

D3 = 0

D4 = 3.267

OR

Prepare Zone/Pre control/ Rainbow chart from the given data and Prepare the decision table.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
.2145	.2140	.2145	.2150	.2140	.2140	.2125	.2152	.2120	.2120	.2125	.2120	.2123	.2124	.2125

16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
.2118	.2140	.2136	.2134	.2139	.2138	.2138	.2139	.2135	.2136	.2138	.2135	.2130	.2139	.2137

31	32	33	34	35	36	37	38	39	40	41	42	43	44	45
.2138	.2133	.2135	.2135	.2140										

Specification limits are 0.212 to .218
Goal is to remain within specification limits. Measurements are sampled hourly.

Q5) Make two Pareto Charts for the data in the following list, one for the number of defectives and one for dollar loss. In each case, include a cumulative percentage graph. **[16]**

Department	Defectives	Dollar Loss
A	20	100
B	120	60
C	80	800
D	100	500
E	50	200
F	30	90

OR

Explain the Concept of PCR, Cp and Cpk with suitable diagrams.

Q6) Explain the concept of DOE, and its various applications with suitable examples from printing industry. **[18]**

OR

Explain various problem solving tools in SPC in detail with suitable examples.

■■■

Total No. of Questions : 6]

SEAT No. :

P1598

[Total No. of Pages : 2

[4163] - 298
T.E. (Printing)
DIGITAL WORKFLOW AND IMAGE SETTING
(2008 Pattern) (Sem. - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***All questions are compulsory.***

2) ***Write answers to different sections on separate answer sheets.***

SECTION - I

Q1) Explain digital workflow and its advantages. **[16]**

OR

Explain jdf workflow.

Q2) Write short notes on : **[16]**

a) PDF-A

b) spreads and chokes

OR

Explain following in details :

a) PJTF

b) imagesetter resolution

Q3) Which file formats are used for illustrations? Explain in details. **[18]**

OR

Write short notes on :

a) job ticket

b) postscript

P.T.O.

SECTION - II

Q4) Explain fundamental of CTP with neat diagram. **[16]**

OR

Explain :

a) Anti-alising

b) interpolation

Q5) Write short note on : **[18]**

a) Light sources used in imagesetter.

b) Internal drum imagesetter.

OR

Explain types of RIP wath their applications.

Q6) Explain concept of soft and hard proofing. **[16]**

OR

Explain the working principle with neat diagram for piezoelectric inkjet printer.

■■■

Total No. of Questions : 10]

SEAT No. :

P1519

[Total No. of Pages : 3

[4163] - 372
T.E. (Automobile Engineering)
AUTOMOTIVE ENGINE DESIGN
(2010 Pattern) (Sem. - II)

Time : 4 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answers to the two sections should be written in separate answer books.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Use of non-programmable electronic pocket calculator is allowed.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) In an Otto engine pressure and temperature at the beginning of compression are 1.1 bar and 35°C respectively. Peak temperature during the cycle is 1650°C and the pressure at the end of the adiabatic compression is 13.5 bar.
Calculate

i) Theoretical thermal efficiency

ii) Heat supplied per kg of air

iii) The work done per kg of air and

iv) The pressure at the end of adiabatic expansion. Take $C_v = 0.717$ kJ/kg K and $\gamma = 1.4$. **[8]**

b) In an air standard Diesel cycle, compression begins at 0.1 MPa and 300° K. The compression ratio is 16. Heat added per kg of air is 1500 kJ/kg. Find.

i) Thermal efficiency

ii) Mean effective pressure

iii) Power output if flow rate is 0.1 kg/sec. Assume R=0.286 kJ/kg^0 K and Cp= 1.0 kJ/kg^0 K for air. **[8]**

OR

P.T.O.

Q2) a) Discuss the Otto cycle in detail and derive the expression for thermal efficiency. **[8]**

b) A 4 cylinder engine with bore and stroke 100 mm develops a BMEP of 11 bar. The rated speed is 3000 rpm and it uses a fuel at the rate of 4.5 kg/hr and calorific value of 19 kJ/kg. Calculate the Brake Power and BSFC.**[8]**

Q3) a) Explain in brief desirable characteristics of combustion chambers for SI engines. **[8]**

b) Discuss the criteria for selecting number of cylinders for any engine. Why is cylinder arrangement important and what are the factors affecting cylinder arrangement? **[8]**

OR

Q4) a) Explain the importance of

i) Engine balancing

ii) Bore to stoke ratio for IC engines. **[8]**

b) A four-cylinder automotive spark-ignition square engine is being designed to provide a maximum brake torque of 150 N-m in the mid-speed range (=3000 rev/min). Estimate the required engine displacement, bore and stroke, and the maximum brake power the engine will deliver. Assume bmep at the maximum engine torque point is 925 kPa and maximum mean piston speed, 15m/s. **[8]**

Q5) a) Explain the concept of a heat balance sheet for IC Engines. **[6]**

b) Explain the process of design of radiator with a neat sketch. **[6]**

c) Explain the function of lubricant and lubrication system. How is the lubricant pump selected? **[6]**

SECTION - II

Q6) A design diagram of a camshaft can be considered as a free two-support beam loaded where the follower exerts maximum force of 2417 N on the cam at distance of 26 mm from left support. Length of camshaft span in 95 mm, outer diameter of camshaft is 32 mm and inner diameter is 10 mm. Find maximum deflection of camshaft. Take E = 220 Gpa. **[16]**

OR

Q7) a) List and explain the properties of commonly used materials for piston connecting rod and crankshaft of an IC Engine. **[8]**

b) List and explain the procedure and factors considered in failure analysis of crankshaft of an IC engine. **[8]**

Q8) a) Explain

i) Compression Test &

ii) Cylinder Power Balance Test. **[8]**

b) Explain working of Exhaust gas CO and HC analyzer with neat sketch. **[8]**

OR

Q9) a) What is distributor dwell -angle? How it affects ignition timings? **[8]**

b) Explain the functions of Engine Performance Analyzer. **[8]**

Q10) Write short notes on **[18]**

a) Variable Compression Ratio (VCR) Engine

b) Stratified Charged Engine

c) Advanced Turbulent Flow Technology (ATFT).

■■■

Total No. of Questions : 12]

P1046

SEAT No. : ____

[Total No. of Pages : 3

[4163] - 202
T.E. (Civil)
INFRASTRUCTURAL ENGINEERING & CONSTRUCTION TECHNIQUES
(2008 Pattern) (Sem. - I)

Time : 3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answers to the two sections should be written in separate books.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain the ideal requirements of the permanent way. **[6]**

b) Give the classification of railway lines based on speed as adopted by Indian Railways. **[6]**

c) Write a short note on minimum depth of ballast cushion. **[4]**

OR

Q2) a) State the comparison of wooden Sleepers & concrete sleepers. **[6]**

b) What is creep? What are its effects? State the maximum permissible values of the same on Indian Railways. **[6]**

c) State the reasons for the preference of flat-footed rails. **[4]**

Q3) a) Define following terms : **[5]**

i) Turnout. ii) Tongue rail

iii) Stock rail iv) Crossing

v) Switch

b) Define gradient. State the various types of gradient. **[5]**

c) A 6° curve branches off from a 3° main curve in opposite direction in the layout of a B.G. yard. If the speed on the branch line is restricted to 35 kmph, determine the speed restriction on the main line. Assume permissible deficiency in cant as 75 mm. **[8]**

P.T.O.

OR

Q4) a) Write short note on : **[8]**

i) Directed Track Maintenance (DTM).

ii) Modernization in Indian Railways.

b) Workout the maximum speed of a train on a B.G. Track having a curvature of 3° and cant of 10 cm. assume allowable cant deficiency as 75 mm. **[6]**

c) Explain the following terms : **[4]**

i) Cant excess.

ii) Cant deficiency.

Q5) a) Compare the advantages & disadvantages of tunnels with open cut. **[6]**

b) Explain in brief NATM method of tunneling. **[6]**

c) State the general sequence of operation for driving tunnels through hard rock. **[4]**

OR

Q6) a) Define breakwater wall. What is the necessity of it? **[4]**

b) Write a short note on TBM. **[4]**

c) Define dock. Differentiate between wet dock and dry dock. **[4]**

d) State various methods of tunnel ventilation and explain any one in detail. **[4]**

SECTION - II

Q7) a) Explain the importance of construction sector in the economic development of a country. **[6]**

b) Explain the Production techniques of precast elements. **[4]**

c) Explain with Detailed sketch the working mechanism of Overhead crane. **[6]**

OR

Q8) a) Draw neat labelled sketches showing various columns to beam connection used in the precast/prefabricated construction. **[6]**

b) What is the need of mechanization in construction industry with merits and demerits of mechanization? **[6]**

c) Write a comment on the difference in the construction techniques of high rise building and regular construction. **[4]**

Q9) a) Explain the methods of finding out productivity of equipment. **[6]**

b) What are the factors affecting for the selection of machinery for any earth work? **[4]**

c) Explain any two terms from the following : **[6]**

i) Repair cost

ii) Economic life

iii) Labour Cost

OR

Q10)a) What is mean by Depreciation cost, find book value of an equipment after 5 years having cost of purchase as 430000, useful life of 7 years & the cost of the equipment after its useful life is 48000, solve by any one method? **[6]**

b) What is work cycle? Explain the work cycle of a Dumper. **[6]**

c) Write a short note on trenching machinery. **[4]**

Q11)a) Enlist the methods of underwater concreting & Explain anyone method of underwater concreting in detail. **[6]**

b) Enlist the methods of dredging & explain any one type of dredger? **[6]**

c) Explain with the sketch the production of crushed sand? **[6]**

OR

Q12)a) Write a short note on Industrial Flooring? **[6]**

b) What are the factors affecting the efficiency of concrete pumps? **[6]**

c) Which are the methods of underwater concreting? Explain any one. **[6]**

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Total No. of Questions : 12]

P1047

SEAT No. : ____

[Total No. of Pages : 4

[4163] - 204
T.E. (Civil)
FLUID MECHANICS - II
(2008 Pattern) (Sem. - I)

Time : 3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, from Section - I Q7 or Q8, Q9 or Q10, Q11 or Q12 from Section - II.***
2) ***Answer any three questions from each section.***
3) ***Answer 3 questions from Section - I and 3 questions from Section - II.***
4) ***Answers to the two sections should be written in separate books.***
5) ***Neat diagrams must be drawn wherever necessary.***
6) ***Figures to the right indicate full marks.***
7) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
8) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Define drag and lift. Give expressions for them. Explain briefly the various types of drag. **[10]**

b) A kite 0.8 × 0.8m weighing 3.9N assumes an angle of 12° to the horizontal. The string attached to the kite makes an angle of 45° to horizontal. The pull on the string is 24.5N when the wind is flowing at a speed of 30 km/hr. Find the corresponding coefficients of drag & lift. Take ρ_{air} = 1.25 kg/m^3. **[6]**

OR

Q2) a) A 60 cm diameter steel pipe of 1.0cm thickness and 300m length carrying water is connected to a needle valve at the d/s end and to the reservoir at the u/s end, has a head of 50m. Determine the rise in pressure if the valve is closed in 0.3 second and 1 second respectively. **[10]**

Take $E_{steel} = 2.47 \times 10^{11}$ N/m^2

$E_{water} = 2.075 \times 10^9$ N/m^2

b) What is water hammer phenomenon? Show that the rise in pressure Δp due to sudden closure of a valve in a pipe is $\rho \subset V$. **[6]**

P.T.O.

Q3) a) Derive an expression for force exerted by a jet on a flat moving plate held indined to the jet. Also calculate work done. **[8]**

b) Explain working of a centrifugal pump. Derive expression for work done by a centrifugal pump. **[8]**

OR

Q4) a) A centrifugal pump running at 1500 rpm against a head of 25m carries 125 *l*/*s* discharge of water. Impeller diameter at the outlet is 0.25m, width is 5cm and vane angle at outlet is 42°. Determine manometric efficiency. **[8]**

b) Write short notes on : **[8]**

i) Selection of pumps.

ii) Cavitation in pumps.

Q5) a) With the help of a diagram, explain the function of each element of hydroelectric plant. **[5]**

b) Define unit speed and specific speed of turbine. Obtain an expression for specific speed. **[5]**

c) Write short notes on : **[8]**

i) Governing of Pelton Wheel.

ii) Characteristic Curve of turbines.

OR

Q6) a) A Petlon Wheel having semicircular buckets and working under a head of 150m runs at a speed of 600 rpm. If the discharge through the nozzle is 45 *l*/*s*. Find the power available at the nozzle and the hydraulic efficiency. Take wheel diameter as 0.5m and C_v for the nozzle as 0.98. **[6]**

b) Explain the hydraulic function of **[6]**

i) draft tube

ii) spiral casing

iii) guide vanes

in case of Francis Turbine.

c) A Pelton wheel develops 5500 kw under a head of 250m at an overall efficiency of 85% and speed 200 rpm. If the head decreases to 150m find the discharge, power & the speed. **[6]**

SECTION - II

Q7) a) Explain the terms-Normal depth, conveyance, section factor, hydraulic exponent, hydraulic radius, wetted perimeter. **[6]**

b) A trapezoidal channel is 10m wide & has slope of 1.25H: 1V. The bed slope is 0.0004. The channel is lined with concrete with n = 0.011. Compute the average velocity and discharge for a depth of flow = 3.6m. **[10]**

OR

Q8) a) Water flows at a velocity of 1 m/s in a rectangular channel 1.0m wide the bed slope is 2×10^{-3} and n = 0.011. Find depth of flow under uniform flow condition. **[8]**

b) Derive the condition for the most efficient trapezoidal channel section. **[8]**

Q9) a) A uniform flow occurs in a 4.9m wide rectangular channel at a depth of 1.9m. The is lined with concrete (n = 0.015) and laid at a bed slope of 0.0008. Calculate how much rise must be provided in the channel bed in order to obtain critical flow. **[8]**

b) A 5m wide rectangular channel carries 12 m^3/s discharge at a depth of 1.4m. **[8]**

i) What is the critical depth?

ii) What is specific energy?

iii) Is the flow subcritical or super critical?

iv) What is depth alternate to 1.4m?

OR

Q10)a) Starting from the first principle, derive the expression for loss of energy in a hydraulic jump. **[8]**

b) Write short notes on : **[8]**

i) Venturiflume.

ii) Hydraulic jump-classification, uses.

Q11)a) Derive an expression for gradually varied flow. **[6]**

b) List the various methods of GVF computations. Explain any one in detail. **[6]**

c) Explain with neat sketches M1, and C1 water surface profiles. **[6]**

OR

Q12)a) A rectangular channel is 20m wide, carries a discharge of 65 m^3/s. It is laid at a slope of 0.0001. At a certain section along the channel length, the depth of flow is 2m. How far upstream (or downstream) will the depth be 2.6m? n = 0.02. **[10]**

b) Explain the profiles on the steep slope & give examples. **[8]**

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Total No. of Questions : 12]

SEAT No. : ____

P1049

[Total No. of Pages : 4

[4163] - 206

T.E. (Civil Engineering)

HYDROLOGY AND WATER RESOURCES ENGINEERING

(2008 Pattern) (Sem. - II)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:-

1) ***Answer three questions from section - I and three questions from section - II.***
2) ***Answers to the two sections to be written in separate answer books.***
3) ***Figures to the right indicate full marks.***
4) ***Draw neat diagrams wherever necessary.***
5) ***Use of calculators is allowed.***
6) ***Assume suitable data if necessary.***

SECTION - I

Q1) a) How hydrology is interdisciplinary science. **[4]**

b) Explain working of infiltrometers. **[6]**

c) The rain gauge station X did not function for a part a month during which a storm occurred. The storm produced rainfalls of 84, 70 and 96 mm at three surrounding stations A, B and C respectively. The normal annual rainfalls at the stations X, A,B and C are respectively 770, 882, 736 and 944mm. Estimate the missing storm at station X. **[8]**

OR

Q2) a) Define hydrology and discuss its importance in the planning of water resources projects. **[4]**

b) Explain in brief different forms of precipitation. **[6]**

c) A rain gauge recorded the following accumulated rainfall during the storm. Draw the mass rainfall curve and the hyetograph. **[8]**

Time (A.M.)	8 : 00	8 :05	8 :10	8 : 15	8 : 20	8 : 25	8 : 30
Accumulated rainfall (mm)	0	1	2	6	13	18	19

Q3) a) What is Unit hydrograph? Discuss the assumptions involved in unit hydrograph theory. **[4]**

b) Give steps in deriving unit hydrograph from given flood hydrograph. **[4]**

P.T.O.

c) Flood hydrograph was recorded in a catchment area 33.48 km^2 had a base flow of 10 cumecs. Calculate ordinate of Unit hydrograph. **[8]**

Time (hr)	0	3	6	9	12	15	18	21
Ord. Storm hydrograph	10	14	18	22	26	24	18	10

OR

Q4) a) Explain infiltation indices with a suitable sketch. **[4]**

b) State and explain Run off and factor affecting runoff. **[4]**

c) Ordinates of 1cm, 1hr. Unit hydrograph are given as below. Average precipitation over catchment area is 3cm/hr for 2hr, followed by 5cm/hr for 1hr, rate of infiltration is 1cm/hr find flood hydrograph ord. **[8]**

Time (hr)	1	2	3	4	5	6	7	8	9	10
Ord. of 1hr. UH. (cumec)	3	10	30	56	31	15	7	3	1	0

Q5) a) Define reservoir and explain different pool levels with a help of suitable diagram. **[4]**

b) What are the factors affecting on site selection of reservoir. **[4]**

c) Explain how sedimentation in a reservoir can be controlled. **[4]**

d) Write a note on flood routing. **[4]**

OR

Q6) a) Explain the various investigation carried out in case of reservoir planning. **[4]**

b) Explain **[4]**

i) Mass curve

ii) Demand curve

c) The details of cost, annual benefits etc. of various proposals are given as below. Suggest the best alternative and justify your answer. **[8]**

Proposal No.	Capital Cost (million Rs.)	Annual maintenance cost (million Rs)	Annual benefits (million Rs)	life (years)	Rate of interest (%)
I	70	1.40	8.5	75	6
II	100	2.00	10.0	80	6
III	60	1.20	6.5	50	6

SECTION - II

Q7) a) Define **[3]**

i) Base period

ii) Duty

iii) Delta

b) Explain different factors affecting duty. **[6]**

c) Find out the capacity of reservoir from the following data. The CCA is 80,000 hectares. Assume canal and reservoir losses as 5% and 10% respectively. **[9]**

Crop	Base period (Days)	Duty (hect./cumec)	intensity of irrigation (%)
Rice	120	1800	25
Wheat	120	2000	30
Sugarcane	320	2500	20

OR

Q8) a) Define **[3]**

i) Crop ratio.

ii) Crop period

iii) Cumecday

b) Explain with the help of example. Time factor and Capacity factor. **[6]**

c) Determine the frequency of irrigation from the following data. **[9]**

i) Field capacity of soil = 35%

ii) Permanent wilting point = 18%

iii) Density of soil = 1.5 gm/cm^3

iv) Depth of root zone = 70cm

v) Daily consumptive use of water = 17mm

vi) Readily available moisture is 75% of the available moisture.

Q9) a) What are the different methods of assessment of water charges? Explain any one. **[4]**

b) Explain recuperation test of determining yield of open well. **[4]**

c) Explain Warabandi system of distribution of irrigation water. **[4]**

d) Calculate specific capacity of an open well from the following data : **[4]**

i) Initial depression head = 5m

ii) Final depression head = 2m

iii) Time of recuperation = 2hrs.

iv) Diameter of well = 3m.

OR

Q10) a) Define **[4]**

i) Aquifer.

ii) Aquiclude

iii) Aquifuge

iv) Aquatard.

b) What are the assumptions made in the analysis of radial flow towards a well. **[4]**

c) A 30 cm diam. Well fully penetrates a confined aquifer 30 m deep. After long time of pumping at rate of 1200 lit./min, drawdowns in the well at 20 m and 45 m from the pumping well were found to be 2.2 m and 1.8 m resp. determine the transmissibility coefficient of aquifer. **[4]**

d) Write down merits and demerits of Sprinkler irrigation system. **[4]**

Q11) a) Describe component part of Lift Irrigation scheme with the help of schematic diag. **[8]**

b) State and explain the causes of water logging. What safety measures would you adopt to prevent water logging. **[8]**

OR

Q12) a) Write a explanatory note on reclamation of waterlogged land. **[4]**

b) What are the merits and demerits of Tile drains? **[4]**

c) State different methods of application of irrigation water and explain any two methods with the help of suitable diag. **[8]**

♦♦♦♦

Total No. of Questions : 12]

SEAT No. : ____

P1050

[Total No. of Pages : 4

[4163] - 207

T.E. (Civil)

PROJECT MANAGEMENT & ENGINEERING ECONOMICS

(2008 Pattern) (Sem. - II)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:-

1) ***Solve Q1 or Q2, Q3 or Q4, Q5 or Q6 from section I and Q7 or Q8, Q9 or Q10, Q11 or Q12 from section II.***
2) ***Answer any 3 questions from each section.***
3) ***Answers to the two sections should be written in separate books.***
4) ***Neat diagrams must be drawn wherever necessary.***
5) ***Figures to the right indicate full marks.***
6) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
7) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Define the term "Project Life Cycle". Draw and describe the project life cycle for construction of a road showing various phases. **[2 + 4]**

b) Briefly explain six functions of Project Management. **[6]**

c) What is Matrix Organisation? State the advantages and disadvantages of such type of organisation. **[2 + 4]**

OR

Q2) Listed below are the activities of a small construction project along with their durations in weeks.

(i – j) Activity	Duration in weeks (tij)
1 - 2	5
1 - 3	10
2 - 4	0
2 - 7	10
3 - 5	5
3 - 6	4
4 - 7	5
5 - 7	8
6 - 7	9

P.T.O.

a) Draw a network and calculate total project duration. Show the critical path. **[6]**
b) Calculate EST, EFT, LST, LFT total floats and free floats for the activities. **[8]**
c) Briefly explain "Independent float' and "Interferring float". **[4]**

Q3) Following table gives the cost duration data for various activities of a construction project.

Activity	Normal Duration (days)	Cost (Rs)	Crash Duration (Days)	Cost (Rs)
1-2	5	2000	4	2400
1-3	7	4200	5	4600
2-4	3	3000	2	3400
3-4	2	2600	2	2600
3-5	6	2400	4	2800
4-6	5	4000	4	6000
5-6	3	3000	2	4400

The overhead cost is Rs. 3000/day.

a) Draw the network, find the project duration and show the critical path based on the normal durations. Also, find corresponding total project cost. **[5]**
b) Carry out step by step crashing and find out optimum project duration and optimum cost of the project. **[10]**
c) Draw the graph of total cost Vs time. **[1]**

OR

Q4) A project has 7 activities. The duration and labour requirement for the activities is as under.

Activity	Duration (Weeks)	Labour Requirement
1 - 2	1	2
1 - 3	2	1
1 - 4	2	1
2 - 5	1	1
3 - 6	3	1
4 - 6	2	1
5 - 6	1	1

a) Draw the squared network and man power loading diagram for EST solution. Find EFR & IFR. **[6]**
b) Carry out resource levelling, if only three men are available for the project execution. Find EFR & IFR. **[10]**

OR

Q5) a) What are the objectives of materials management? **[6]**

b) Define "Inventory" and "Inventory Management". What are the different methods of inventory control? **[2 + 2]**

c) A construction company purchases 10,000 bags of cement annually. Each bag of cement cost Rs. 300/- and the cost incurred in procurring each lot is Rs. 150/-. The cost of carrying is 25%. What is the most Economic order Quantity? What is the average inventory level? **[6]**

OR

Q6) a) Define "Break - Even Analysis". Explain the principles and uses of Break - Even Analysis. **[2 + 4]**

b) Carry out ABC analysis for the following items and plot ABC curve. **[10]**

Item No.	Item	Annual Expenditure (Rs)
1	Cement	5,00,000
2	Sand	3,00,000
3	Bricks	1,00,000
4	Siporex Blocks	2,50,000
5	Paint	60,000
6	Steel	4,50,000
7	Tiles	70,000
8	Oil	2,000
9	Course Aggregate	95,000
10	Electrical fitting	50,000
11	Nails	1,500
12	Timber	42,000

SECTION - II

Q7) a) A bridge is to be constructed over a river. Span of the bridge is 30 m and it has to cross 0.5 km length of the river. Draw a site layout to facilitate various operations. **[9]**

b) Explain various precautions required to be adopted for scaffolding, ladders and formwork. **[3 + 3 + 3]**

OR

Q8) a) Why is safety training required? Write a safety programme for a National Highway project. **[2 + 4]**

b) Explain the important points to be considered before finalising any site layout. **[6]**

c) What are the different causes of accidents at a tunnel site? **[6]**

Q9) a) Give three definitions of Economics quoted by different Economists. Explain the importance of Economics in construction industry. **[3 +3]**

b) Define "Demand Schedule". Explain law of Demand with an example. Draw demand curve. **[2 + 2 + 2]**

c) What is "Market Equilibrium"? Explain in short "Equilibrium Price" and "Equilibrium Quantity" with an example. **[1 +3]**

OR

Q10) a) Differentiate between cost, Price and value by giving suitable example. **[6]**

b) State "Law of supply". Give one example of supply schedule and draw supply curve. **[2 + 4]**

c) Explain "Law of Diminishing Marginal utility" with an example. **[4]**

Q11) a) A company is thinking about investing Rs. 10 lakhs in a new project. According to budget analysis the company will generate the following cash flows. The rate of interest is 12% should the company invest in the new project? **[8]**

Year	Cash flow in Rs.
1	2 lakhs
2	6 lakhs
3	8 lakhs
4	2 lakhs

b) What is the present value of a 4 years annuity, if the annual interest is 5% and the annual payment is Rs. 1000/-? **[4]**

c) State the advantages of N.P.V. method over I.R.R. method. **[4]**

OR

Q12) a) What is time value of money? Explain with an example. **[3]**

b) A company wishes to invest in a new project. It has two alternatives A & B. Following data pertains to the two alternatives. **[10]**

Particulars	Project A	Project B
Initial investment	1,00,000	1,50,000
Cash inflows		
year 1	70,000	90,000
2	50,000	85,000
Interest Rate	10%	10%

Which project will the company select based on N.P.V. and I.R.R.?

c) Differentiate between "Working Capital" and "Fixed Capital". **[3]**

♦♦♦♦

Total No. of Questions : 8]

SEAT No. : ____

P1051

[Total No. of Pages : 7

[4163] - 208

T.E. (Civil)

STRUCTURAL DESIGN - II

(2008 Pattern) (Sem. - II)

Time :4 Hours] ***[Max. Marks :100***

Instructions to the candidates:-

1) ***Answer Q.1 or Q.2, Q.3 or Q.4 in section I.***
2) ***Answer Q.5 or Q.6, Q.7 or Q.8 in section II.***
3) ***Answer to two sections should be written in separate books.***
4) ***Figures to the right indicate full marks.***
5) ***Use of IS : 456 - 2000 and non programmable calculator is allowed.***
6) ***Neat diagrams must be drawn wherever necessary.***
7) ***Mere reproduction from IS code as answer will not be given full credit.***
8) ***Assume any other data if necessary.***

SECTION - I

Q1) a) Answer the following **[9]**

i) The term 'balanced section' is used in both WSM and LSM. Discuss the difference in meaning.

ii) Justify the code specification for the limiting neutral axis depth in LSM.

iii) Why is it uneconomical to use high strength steel as compression reinforcement in design by WSM?

b) A reinforced concrete beam section of size 300 mm × 700 mm effective depth is reinforced with 3 bars of 20 mm diameter in tension.

The concrete mix and HYSD steel reinforcement used are of grades M20 and Fe415 respectively.

Find **[8]**

i) Depth of neutral axis.

ii) Type of reinforced section.

iii) Moment of resistance.

iv) Maximum stresses induced in the materials W.S.M. is recommanded.

P.T.O.

c) A reinforced concrete rectangular section of size 300 × 600 mm effective depth is reinforced by 3 bars of 20 mm diameter. The effective span of the beam is 6 m. Find

i) Depth of neutral axis.

ii) Type of the section.

iii) Moment of resistance.

iv) Uniformly distributed ultimate load.

Materials : M20 concrete Mix. and Fe415 grade reinforcement

Method of Design :- L.S.M. **[8]**

OR

Q2) a) Derive the equation for neutral axis constant (C Kumar) by drawing strain diagram of balanced R.C. section and then show that the limiting depth of neutral axis for rectangular balanced section reinforced with Fe250, Fe415 and Fe500 grade of steel is given as 0.53d , 0.48 d and 0.46 d respectively. **[9]**

b) A rectangular section of size (230 mm × 450 mm) effective depth is reinforced with 2 bar 20 mm diameter as compression steel and 3bar 25 mm diameter as tension steel. The compression steel has effective cover of 40 mm.

Find

i) Depth of neutral axis.

ii) Type of section.

iii) Moment of resistance.

Materials :- M20 grade of concrete.

Fe415 grade of steel.

W.S.M. is recommanded. **[8]**

c) Calculate the moment of resistance by LSM for flanged beam section detailed as below

i)	Effective flange width	=	1200 mm.
ii)	Width of rib	=	300 mm
iii)	Thickness of flange	=	100 mm.
iv)	Effective depth	=	560 mm.
v)	Tension steel	=	4 No. 25 mm diameters

Materials :- M20 grade of concrete.

Fe415 grade of reinforcement. **[8]**

Q3) The central line plan of building is as shown in figure. 1 Classify the slabs structurally and design the slab S_1 and S_2 only for flexure by L.S.M.

Draw neat sketches showing details of reinforcement.

Take live load = 4 kN/m^2.

Floor finish = 1.5 kN/m^2.

Materials :- M25 grade of concrete

Fe415 grade of reinforcement

Assume suitable data if required. **[25]**

OR

Q4) Design flight I and II of the stair case as shown in fig. 1 for the following data :

a) Floor to floor height = 3.2 m.

b) Rise = 160 mm, Tread = 250 mm.

c) Width of landing = 1.115 m.

d) Width of stair = 1m

e) Gap between flights = 100 mm.

Show detailed load calculation and reinforcement details in sectional elevation for both flights. At ground floor, plinth beam is provided below 1st step. Assume suitable data if required. **[25]**

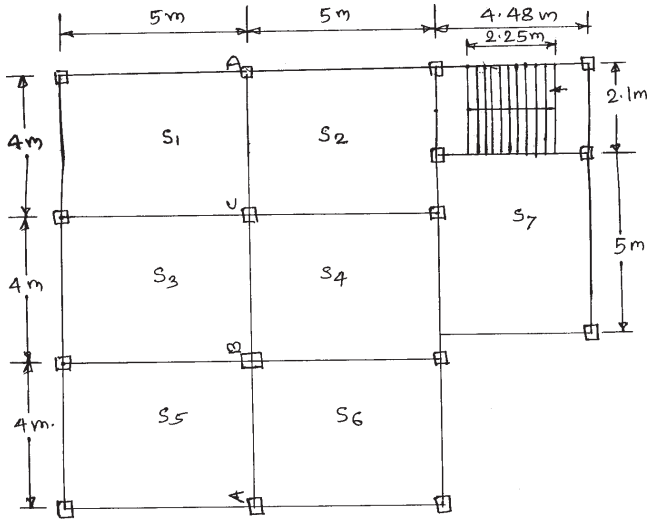


fig. 1

SECTION - II

Q5) A structural part plan showing centre line of the beams and positions of columns as shown in fig. 1. Design beam 'AB' of a continuous floor beam ABCD supporting the slab for the following data.

a) Live load = 4 kN/m^2

b) Floor finish = 1 kN/m^2

c) Thickness of slab = 130 mm

d) Width of support = 230 mm

e) Thickness of wall = 230 mm

f) Height of wall = 3 m

g) Unit wt. of masonry = 20 kN/m^3

h) F_{sc} = 350 N/mm^2 **[25]**

OR

Q6) A reinforced concrete beam ABC of rectangular section is simply supported at 'A' and 'C' and continuous over support 'B'. Span AB = 5m and span BC = 4 m. The beam carries a load of 20 kN/m (inclusive of self wt) and live load of 12 kN/m. Design continuous beam ABC by limit state method with 10% redistribution of moment use M20 and Fe415 materials.

Sketch the bending moment envelop and the reinforcement details. **[25]**

Q7) Design an axially loaded short column at 'C' as shown in Fig. 1 in ground floor and below plinth along with isolated footing for G + 2 building with following details.

a) Floor to floor height = 3.2 m

b) Depth of foundation below ground level = 1.2 m

c) Height of plinth above ground level = 0.6 m

d) Live load on all slab = 3.5 kN/m^2

e) Floor finish load = 1.0 kN/m^2

f) Water proofing load on roof slab = 2 kN/m^2

g) Thickness of wall on all floor beams = 230 mm

h) Size of all beams = (230 × 450)mm

i) Safe bearing capacity (SB.C) = 200 kN/m^2

Materials - M20 grade of concrete
Fe415 grade of steel

Show detailed load and design calculations and reinforcement details in plan and sectional elevation. **[25]**

OR

Q8) Design a rectangular column subjected to an axial load of 600 kN along with a working moment of 75 kN/m about an axis bisecting the depth. The unsupported length of column is 3.2 m. Assuming column effectively held in position and restrained against rotation.

Also design its footing considering above moment and axial load.

Take S.B.C. of soil = 225 kN/m^2

Show detailed design calculation and reinforcement details of column and footing

Use Materials : M20 grade of concrete
Fe415 grade of steel.

Use charts for column design. **[25]**

Chart 31 COMPRESSION WITH BENDING – Rectangular Section – Reinforcement Distributed Equally on Two Sides

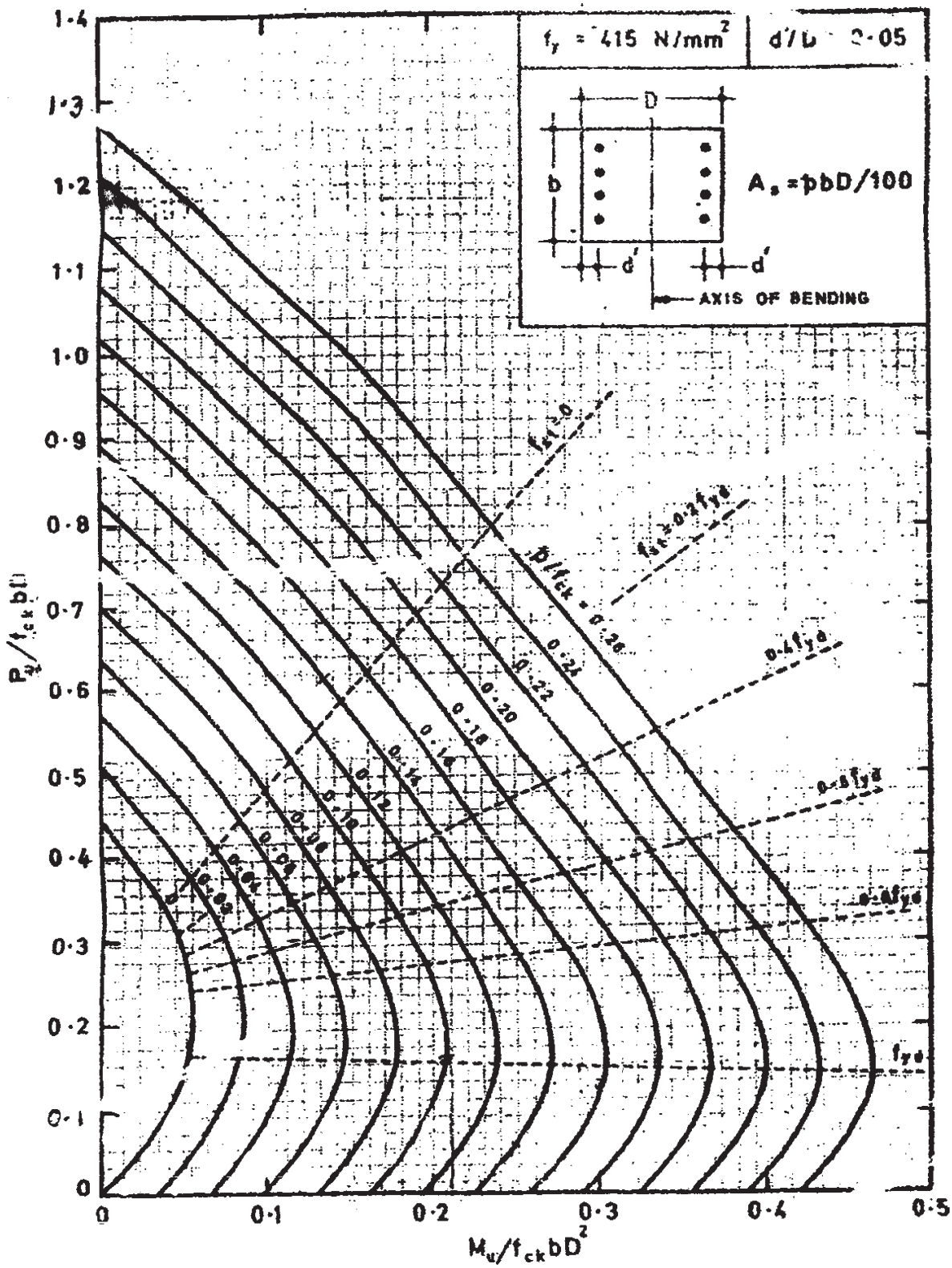


Chart 32 COMPRESSION WITH BENDING – Rectangular Section – Reinforcement Distributed Equally on Two Sides

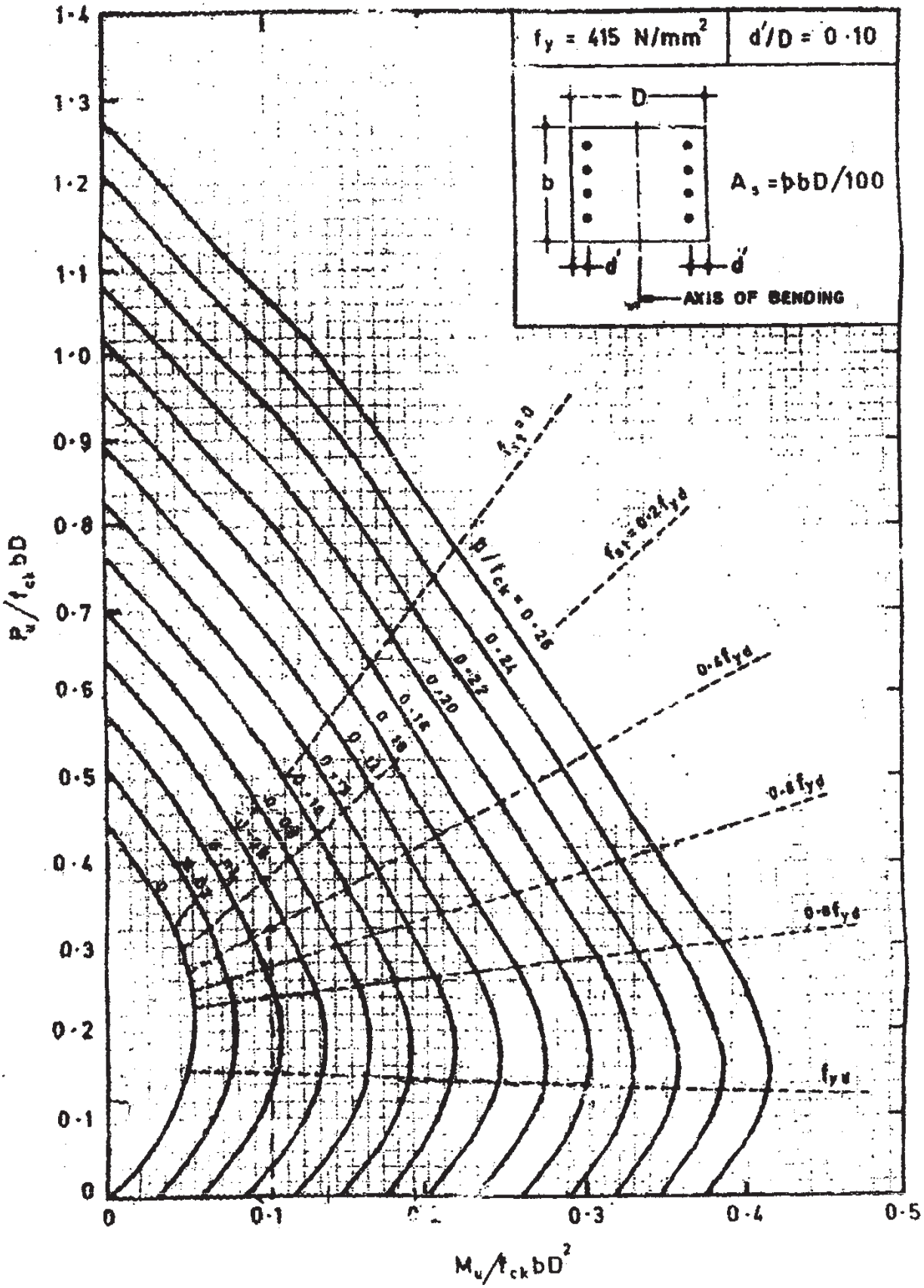
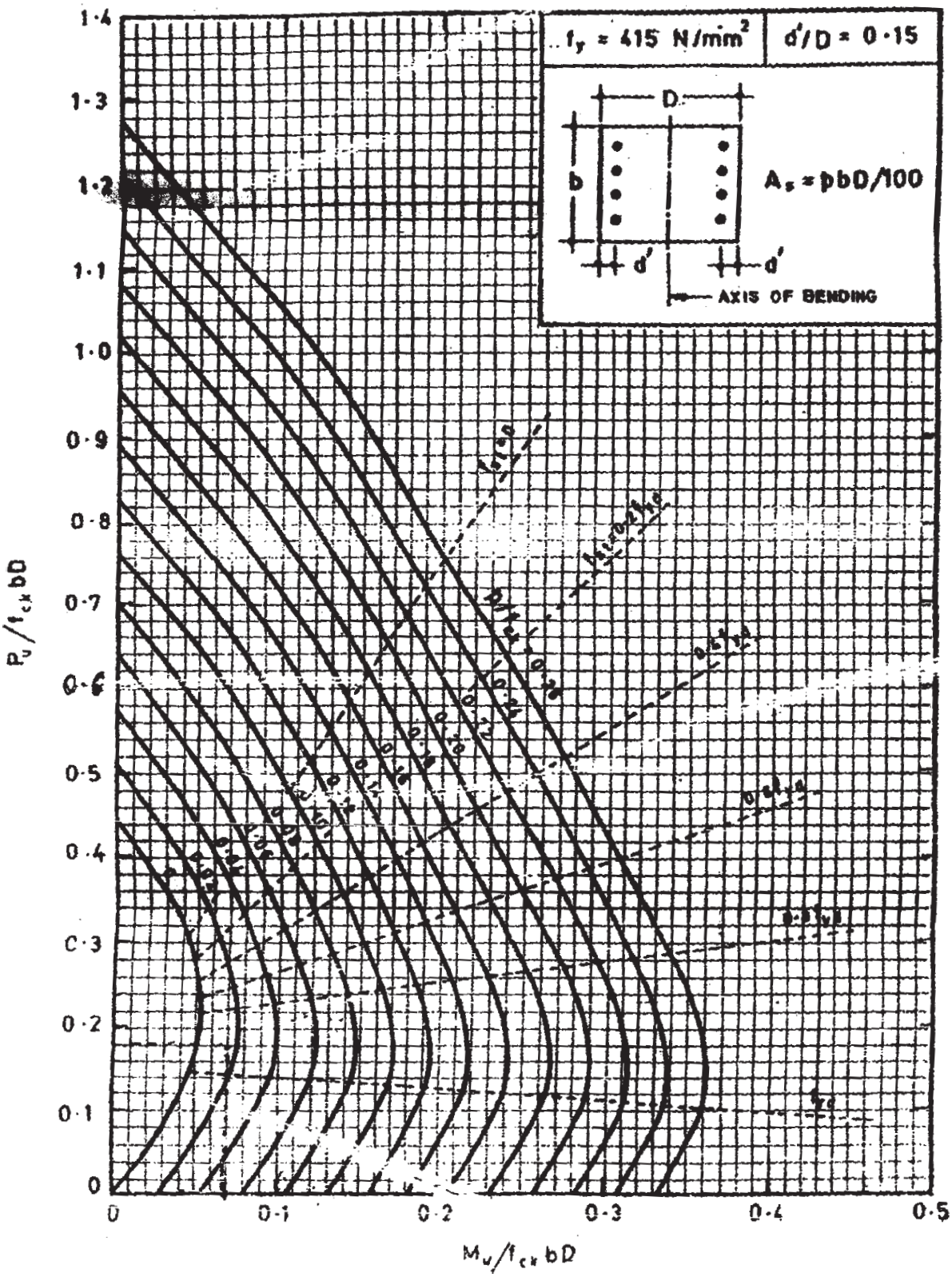


Chart 33 COMPRESSION WITH BENDING – Rectangular Section – Reinforcement Distributed Equally on Two Sides



♦♦♦♦

Total No. of Questions : 12]

SEAT No. : ____

P1052

[Total No. of Pages : 4

[4163] - 209

T.E. (Civil)

ENVIRONMENTAL ENGINEERING - I

(2008 Pattern) (Sem. - II)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:-

1) ***Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6 form section I and Q.7 or Q.8, Q.9 or Q.10, Q.11 or Q.12 from section II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn whrever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic table electronic pocket calculator and steam table is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What is Demand of water? Elucidate various demands of a town. **[8]**

b) Furnish types of pipes available for use in water supply? Discuss their merits and demerits. **[6]**

c) State the HDL and MPL limits as per IS10500 for drinking water. **[4]**

i) Sulphate.

ii) Nitrates.

iii) Turbidity.

iv) Fluorides.

OR

Q2) a) Estimate the population of the town by incremental increase method and Geometric increase method, for the year 2021 and 2041, if following is the census data. **[8]**

Year	1961	1971	1981	1991	2001	2011
Population	48500	57850	66700	78450	88000	98950

b) Enlist various valves used in rising mains. Also state their location and functions. **[6]**

c) What is turbidity? How it occur in water? Also mention its unit. **[4]**

P.T.O.

Q3) a) Design a mechanical clariflocculator to treat water for a town having population 1.5 lakh and rate of water supply 150 lpcd. Detention period is 30 minutes and paddle speed is 3 rpm. Use depth of basin = 3.0 m, horizontal velocity = 1.0 m/min. Assume C_D = 1.8 for planks, kinematic viscosity = 0.8039×10^{-6} m^2/sec and centre to centre distance between the shafts and paddle = 3.0 m. **[8]**

b) Enlist various units employed in a water treatment plant. Furnish functions fulfilled by each of these units. **[5]**

c) Give reasons for the following **[3]**

i) Residual chlorine should be maintained in water after complete disinfection.

ii) Lime is added along with Alum in jar test.

iii) Slow mixing is very important in flocculation process.

OR

Q4) a) Differentiate between Coagulation and Flocculation with respect to various points. **[6]**

b) State the factors affecting the efficiency of sedimentation. With the help of neat sketch describe the fill and draw type of sedimentation tank. **[6]**

c) Define the following terms : **[4]**

i) Detention period.

ii) Discrete particle.

iii) Surface loading.

iv) Mean velocity Gradient (G)

Q5) a) Enlist and explain various operational troubles associated with rapid sand gravity filter. **[6]**

b) Answer the following with respect to rapid sand filter. **[6]**

i) Initial and final head loss.

ii) Effective size of filter media.

c) Enlist various methods of disinfection of water. State their suitability. **[4]**

OR

Q6) a) A filter unit of size 4 m × 8 m. After filtering 8000 m^3/day in 24 hours of period, the filter is backed washed at the rate of 10 lit/m^2/sec for 10 minutes. Compute the average filtration rate, quantity and percentage of treated water used in washing and the rate of wash water flow in each trough. The unit has four troughs. **[8]**

b) Explain break point chlorination with neat sketch. **[4]**

c) Write note on mixed media filters **[4]**

SECTION - II

Q7) a) A water sample contains the following impurities. Compute the annual requirements of slaked lime and soda ash for treating 0.1 MLD water. The purity of slaked lime is 85% and that of soda ash is 90%. **[10]**

$Ca(HCO_3)_2$ = 220 mg/l, $MgCl_2$ = 160 mg/l,
$Mg(HCO_3)_2$ = 140 mg/l, $MgSO_4$ = 110 mg/l,
$CaSO_4$ = 120 mg/l, NaCl = 25 mg/l,
Na_2SO_4 = 45 mg/l.

b) Describe various methods of defluoridation. **[4]**

c) Enlist various methods of colour and odour removal and explain any one. **[4]**

OR

Q8) a) Enlist various methods of demineralization of water. Explain Reverse Osmosis in detail. **[7]**

b) Write a short note on water treatment for swimming pools. **[4]**

c) Explain the ion exchange method of water softening. **[7]**

Q9) a) Write a short note on various methods for detection of water wastage. Explain how this wastage can be prevented. **[6]**

b) Compare continuous and intermittent systems of water supply. **[4]**

c) Draw a line sketch of a RCC Elevated service Reservoir and give the list of accessories provided for ESR. **[6]**

OR

Q10) a) Determine the balancing capacity of an ESR for a town having a population of 2 million and water supply rate of 280 lit/cap/d. The water is pumped continuously for 24 hours. The break up of demand is as follows : **[9]**

Time	demand in lit/cap/d
3 am - 9 am	80
9 am - 1 pm	50
1 pm - 7 pm	85
7 pm - 11 pm	30
11 pm - 3 am	35

b) Explain benefits of rain water harvesting and discuss the various methods of rain water harvesting. **[7]**

Q11) a) Write a short note on **[6]**

i) ESP

ii) Bag Filter House.

b) Determine the cumulative SPL for a factory having 4 machines with 70 dB, 63 dB, 75 dB and 76 dB SPLs respectively. **[5]**

c) Explain various methods to control noise pollution. **[5]**

OR

Q12) a) Explain the following : **[6]**

i) Green house effect.

ii) Stratospheric ozone depletion.

b) Explain the effect of various atmospheric stability conditions on dispersion of air pollutants. **[5]**

c) Determine equivalent noise level for the following noise level measurements in a shopping mall. **[5]**

Time in hrs.	Sound level (dBA)
5.00 - 7.00	43
7.00 - 9.00	56
9.00 - 11.00	64
11.00 - 13.00	70
13.00 - 15.00	69
15.00 - 17.00	55

♦♦♦♦

Total No. of Questions : 12]

P1055

SEAT No. : ____

[Total No. of Pages : 5

[4163] - 212
T.E. (Mechanical)
HEAT TRANSFER
(Common to Automobile & Mech. S/W)
(2008 Pattern) (Sem. - I)

Time : 3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer one question from each unit. Answer three questions from Section - I and three questions from Section - II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rules, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Unit - I

Q1) a) How does the thermal conductivity of an insulating material vary with temperature? Explain with the help of suitable examples and sketches. **[4]**

b) Define Thermal Diffusivity & explain its significance. **[4]**

c) A square plate heater measuring 16 cm × 16 cm and of rating 1 kW is inserted between two slabs. Slab A is 2 cm thick [k = 60W/m°C] and slab B is 1 cm thick [k = 0.25 W/m°C]. The outside heat transfer coefficients on side A and side B are 200 W/ m^2 °C and 50 W/m^2°C respectively. If the surrounding air is at 20°C, make calculations for the maximum temperature in the system and outer surface temperature of two slabs. Also calculate the heat transfer through each slab. **[8]**

OR

Q2) a) Explain in brief following : **[8]**

i) Newton's Law of Cooling.

ii) Isotropic & Anisotropic Materials.

P.T.O.

iii) Logarithmic Mean Area [LMA] for hollow cylinder.

iv) Comparison between Steady State & Unsteady State.

b) A plane wall is 15 cm thick of surface area 4.5 m^2. Thermal conductivity of the wall is 9.5 W/m°K. The inner and outer surface temperatures of the wall are maintained at 150°C and 45°C respectively.

Determine. **[8]**

i) Heat flow rate across the wall.

ii) Temperature gradient in the heat flow direction.

iii) Temperature of the surfaces at 5 cm and 10 cm away from the inner surface.

Unit - II

Q3) a) Derive an expression for heat transfer through composite cylinder with conduction & convection. **[5]**

b) A solid sphere of radius R, thermal conductivity k, has the uniform heat generation of g[W/m^3]. Show that **[6]**

$$T = \frac{g}{6k}[R^2 - r^2] + \frac{gR}{3h} + T_\infty$$

c) An exterior wall of a house may be approximated by a 100 mm layer of common brick [k_1 = 0.7 W/m°K] followed by a 40 mm layer of gypsum plaster [k_2 = 0.065 W/m°K]. What thickness of loosely packed Rockwool insulation [k_3 = 0.065 W/m°K] should be added to reduce the heat loss [or gain] through the wall by 80%. **[5]**

OR

Q4) a) Explain in brief following : **[8]**

i) Overall Heat Transfer Coefficient.

ii) Thermal Contact Resistance.

iii) Desirable Properties of Thermal Insulating Materials.

iv) Critical Thickness of Insulation

b) A long hollow cylinder has an outer radius of 5cm and 15cm respectively. It generates heat at the rate of 1 kW/m^3, the thermal conductivity of the material is 0.5W/m°K. If the maximum temperature occurs at radius of 10 cm and the temperature at the outer surface is 50°C, find **[8]**

i) Temperature at the inner surface.

ii) Maximum temperature at the cylinder.

Derive the formula you may use.

Unit - III

Q5) a) Starting from boundary conditions, derive the expressions for temp distribution along the length and heat flow rate for a very long fin using standard notations. **[9]**

b) Steel ball of 12 mm in diameter are annealed by heating to 1150 K and then slowly cooling to 400 K in an environment where temperature is 325K and heat transfer coefficient is 20 W/m^2-K. Calculate the time required by the balls to reach the desired temperature. If this time is to be reduced to 10 minutes, how much improvement in heat transfer coefficient is needed? Justify the formula used. Use following properties of steel. Density = 7800 kg/m^3, specific heat = 600 J/kg-K, Thermal conductivity = 40W/m-K. **[9]**

OR

Q6) a) Derive an expression for temperature variation during quenching of a billet by "Lumped heat capacity method". State the assumptions made. **[9]**

b) The end of a very long cylindrical stainless steel rod is attached to a heated wall and its surface is in contact with a cold fluid. Determine by what percentage the heat removal rate would change. **[9]**

i) if the rod diameter were doubled.

ii) if the rod is made up of aluminium.

Use k for Al = 204.7 W/mK. K for S.S. = 16.17 W/mK.

SECTION - II

Unit - IV

Q7) a) Explain significance of Shape Factor. Explain any 4 properties / rules of shape factor. **[6]**

b) Assuming the Sun to be a black body emitting radiation with maximum intensity at λ = 0.49 μm, calculate the surface temperature of the Sun and the heat flux at the surface of the Sun. **[4]**

c) Write a note on Radiation shield. State its applications. **[6]**

OR

Q8) a) A pipe carrying steam having an outside diameter of 20 cm runs in a large room and is exposed to air at a temperature of 30°C. The pipe surface temperature is 400°C. Calculate loss of heat to the surroundings per metre length of pipe, due to thermal radiation. The emissivity of pipe surface is 0.8. What would be loss of heat due to radiation, if the pipe is enclosed in a 40 cm diameter brick conduit of emissivity 0.91. Find percentage change in heat transfer. **[8]**

b) The net radiation from the surfaces of two parallel plates maintained at T_1 and T_2 is to be reduced by 99%. Calculate the number of radiation shields to be placed between the two surfaces to achieve this reduction in heat exchange assuming the emissivity of the shields as 0.05 and that of the surfaces as 0.8. **[8]**

Unit - V

Q9) a) Explain Thermal and Velocity Boundary layer. **[6]**

b) Find rate of heat loss from a cubical furnace kept on a concrete floor, if the outside surface temperature of the furnace is 80°C and the surrounding air is at 20°C. Sides of furnace are 1m each. Neglect loss due to convection from the base. Also neglect radiation mode of heat transfer.

Use :

i) $Nu = 0.13 (GrPr)^{1/3}$ for vertical surface.

ii) $Nu = 0.14 (GrPr)^{1/3}$ for horizontal surface

At 50°C, the properties of air are :

ρ = 1.013 kg/m^3, v = 17.95 × 10^{-6} m^2/s, μ = 19.6 × 10^{-6} Ns/m^2,

Cp = 1005 J/kgK, k = 0.0283 W/mK, Pr = 0.698. **[12]**

OR

Q10)a) Assuming man as a cylinder 350 mm diameter and 1.65m height with surface temperature of 28°C, find the heat he would lose while standing in a 30 km/hr wind at 12°C. Use : $Nu = 0.027 (Re)^{0.805} (Pr)^{1/3}$.

Properties of air at 20°C are

$k = 0.0259$ W/m°C, $v = 15 \times 10^{-6}$ m^2/s, $Pr = 0.707$ **[6]**

b) Write formulae and explain significance of Reynolds number, Grashoff number, Prandtl number and Nusselt number. **[8]**

c) Explain difference between local and average heat transfer coefficient. **[4]**

Unit - VI

Q11)a) Explain Regimes of Pool Boiling. **[8]**

b) A counter flow double pipe heat exchanger is used to heat water from 20°C to 80°C at a rate of 1.2 kg/s. The heating is to be accomplished by geothermal water available at 160°C at a mass flow rate of 2 kg/s. The inner tube is thin walled and has a diameter of 1.5 cm. If the overall heat transfer coefficient of the heat exchanger is 640 W/m^{20}C, determine the length of heat exchanger required to achieve the desired heating. Also comment on the magnitude of the length of heat exchanger achieved in this problem.

Take $Cp_{water} = 4.18$ kJ/kg°C, $Cp_{Geothermal\ water} = 4.31$ kJ/kg°C. **[8]**

OR

Q12)a) Derive an expression for LMTD for parallel flow heat exchanger with usual notations. **[8]**

b) Write a note on : **[8]**

i) Heat Transfer Augmentation Techniques.

ii) Heat Pipe.

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Total No. of Questions : 12]

P1057

SEAT No. : ____

[Total No. of Pages : 3

[4163] - 214
T.E. (Mechanical) (Common to Automobile)
INDUSTRIAL ENGINEERING & TECHNOLOGY MANAGEMENT
(2008 Pattern) (Sem. - I)

Time : 3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer 3 questions from Section - I and 3 questions from Section - II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain the Frederick Taylor's contribution towards scientific management. **[6]**

b) Explain Vroom's expectancy theory. **[4]**

c) List different functions of management and explain in detail planning. **[6]**

OR

Q2) a) Explain in detail with figures the types of plant layout. **[8]**

b) Explain the objectives of material handling and material handling equipments. **[8]**

Q3) a) Explain productivity improvement methods for organization. **[6]**

b) Write a note on SIMO chart. **[4]**

c) Explain the benefits and objective of Merit Rating. **[6]**

OR

P.T.O.

Q4) a) Explain objective of Job evaluation. **[6]**

b) Show and describes method study symbols for recording the facts. **[6]**

c) State the limitations of time study. **[4]**

Q5) a) Explain the objective of production forecasting. **[6]**

b) Give the purpose of inventory control. **[6]**

c) A manufacturing company requires 9500 units per year. Ordering cost is Rs. 125 per order and carrying cost is 20%. Purchase price per unit is Rs. 45. Determine : **[6]**

i) EOQ

ii) Optimum number of orders

iii) Total cost including acquisition of material.

OR

Q6) a) What are the uses of breakeven analysis? **[6]**

b) Explain in details what are the different elements of costs. **[6]**

c) Differentiate between CPM and PERT with its uses. **[6]**

SECTION - II

Q7) a) Define 'Technology Management' and explain its significance. **[6]**

b) Explain the role of Government in the development of Technology. **[6]**

c) Differentiate between 'Product Technology' and 'Process Technology'. **[4]**

OR

Q8) a) Explain the importance of Technology Management in present scenario. **[6]**

b) Explain the relationship between Technology development & Competition. **[6]**

c) Write a short note on Forms of Technology. **[4]**

Q9) a) Explain the various techniques used in Technology Forecasting. **[6]**

b) Explain with example 'Technology Leadership & Followership'. **[6]**

c) Discuss the Morphological Analysis. **[4]**

OR

Q10)a) Explain the scope of Innovation Management. **[6]**

b) What is Technology Assessment? **[4]**

c) Explain in brief the following : **[6]**

i) Technology monitoring.

ii) Mission Flow diagram.

Q11)a) What do you understand 'Technology diffusion and Technology Absorption? **[6]**

b) Explain the challenges of globalization. **[6]**

c) Write a short note on : **[6]**

i) 'SWOT' analysis.

ii) IPR (Intellectual Property Rights).

OR

Q12)a) State and explain the various levels of Technology Transfer. **[6]**

b) Write a short note on : **[6]**

i) Innovation cost.

ii) Rate of Diffusion of Technology.

c) Draw and explain the 'S-curve' of Technology Adoption. **[6]**

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Total No. of Questions : 12]

P1058

SEAT No. :

[Total No. of Pages : 3

[4163] - 215
T.E. (Mechanical)
(Common to Automobile)
COMPUTER ORIENTED NUMERICAL METHODS
(2008 Pattern) (Sem. - I)

Time : 3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer 3 questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of programmable calculator is not permitted.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Evaluate $\int_0^1 \frac{1}{1+x^2}\,dx$. Use 3 point Gauss Legendre method. **[8]**

b) Draw flowchart for successive iteration method. **[8]**

OR

Q2) a) Find a real root of the equation, $e^x \cos(x) - 1.2 = 0$ by the Newton Raphson method correct to three decimal places. State how do you select initial value of x. **[8]**

b) Draw flowchart for integration by $3/8^{th}$ Simpson rule. **[8]**

Q3) a) The following data gives the values of y corresponding to certain values of x. Find the value of x when $y = 167.59789$ by applying Lagrange's method. **[8]**

x	1	2	5	7
y	1	12	117	317

b) Draw a flowchart for calculation and printing of backward difference table. **[8]**

OR

P.T.O.

Q4) a) The velocity 'v' of a body during the time 't' is given in a following table. Find the acceleration at t = 1.1. **[8]**

t	1.1	1.2	1.3	1.4
v	47.7	52.1	56.4	60.8

b) Draw a Flowchart for Lagrange's interpolation. **[8]**

Q5) a) Using Gauss Seidal method, solve the following set of simultaneous equations up to 03 decimal places. **[10]**

$$x + 2y + z = 0$$
$$3x + y - z = 0$$
$$x - y + 4z = 3$$

b) Draw a Flowchart for Thomas algorithm. **[8]**

OR

Q6) a) Using Gauss Elimination Method, solve the following set of simultaneous equations. **[10]**

$$2x + 4y - 6z = -4$$
$$x + 5y + 3z = 10$$
$$x + 3y + 2z = 5$$

b) Draw a Flowchart for Gauss Seidal method with relaxation (RF). **[8]**

SECTION - II

Q7) a) Explain Least Square Method. **[4]**

b) For the data given in following table find the equation to best fitting curve of the form $x\,y^a = b$. **[8]**

x	200	150	100	60	40	10
y	1	1.5	1.8	2.4	4.1	6.5

c) Explain : **[4]**

i) Error Propagations

ii) Round off errors

OR

Q8) a) If $u = 3v^7 - 6v$, find the percentage of error in 'u' and $v = 1$, if error in 'v' is 0.05. **[8]**

b) Draw a Flowchart for Q7 b. **[8]**

Q9) a) Use Runge Kutta 4th order method to solve $y' - \sin(y) = 1$, from $x = 0$ to 0.5 in steps of $h = 0.1$. **[8]**

b) Draw a Flowchart for modified Euler's method. **[8]**

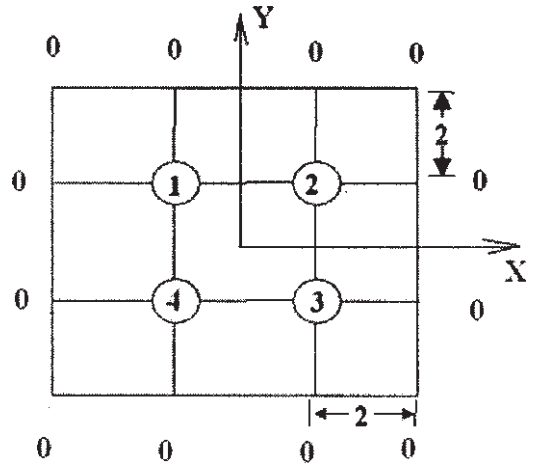
OR

Q10)a) Obtain the solution of $\frac{dy}{dx} = 3x + y^2$ using Taylor's series method.

Given : $y(0) = 1$. Determine $y(0.1)$ **[8]**

b) Draw a Flowchart for Milne's Predictor corrector method. Assume suitable notations. **[8]**

Q11)a) Solve the equation $\frac{d^2u}{dx^2} + 2\frac{d^2u}{dy^2} = \frac{1}{x.y}$ corresponding to grid shown in following figure 1. **[10]**



b) Draw a Flowchart for solution of Poisson's equation. **[8]**

OR

Q12)a) Second order differential equation is **[10]**

$x^2 \frac{d^2y}{dx^2}(x-2)\frac{dy}{dx} - 3y = 10x$ subject to consideration $y(0) = 0$, $y(0.3) = 10$, $h = 0.1$. Solve by Finite difference method.

b) Draw a Flowchart for solution of Wave equation. **[8]**

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Total No. of Questions : 12]

SEAT No. : ____

P1059

[Total No. of Pages : 7

[4163] - 216
T.E. (Mechanical)
MACHINE DESIGN - II
(2008 Pattern) (Sem. - II)

Time :4 Hours] ***[Max. Marks :100***

Instructions to the candidates:-

1) ***Answer three questions from Section - I and three questions from Section - II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Unit - I

Q1) a) Write procedure to select ball bearing from manufacturing catalogue. **[6]**

b) A shaft with centrally mounted left hand helical pinion is supported on two deep groove ball bearings at both ends. Centre distance between two bearings is 200 mm. Pinion is rotating in anticlockwise direction when viewed from right side pinion is transmitting 15 kW power at 1440 rpm in horizontal direction. Pitch circle diameter of pinion is 80 mm. Normal pressure angle and helix angle are 20° and 22° respectively. The required reliability of bearing is 95% with life 12,000 hours. Find dynamic load carry capacity of bearing to select it from manufacturer's Catalogue which is based on 90% reliability. Take,
Shock factor Ka = 1.3
Radial load factor X = 0.56
Thrust factor Y = 1.25 **[12]**

OR

Q2) a) A single row deep groove ball bearing is used to support shaft of four speed automobile gear box. It is subjected to following cycles.

Gear	Axial load 'N'	Radial load 'N'	Radial load factor X	Axial load factor Y	%Time engaged
First	3250	4000	0.56	1.176	1%
Second	500	2750	1	0	3%
Third	50	2750	1	0	21%
Fourth	Nil	Nil	1	0	75%

P.T.O.

The shaft is connected to engine shaft & rotate at 1750 rpm. Calculate dynamic load carrying capacity, If expected life of bearing is 4000 hours. **[10]**

b) Sketch face to face and back to back arrangements for taper roller bearing. **[4]**

c) Explain terms 'rated life' and median life of bearing. **[4]**

Unit - II

Q3) a) Following data is given for 360° hydrodynamic bearing Radial load = 30 kN.
Journal diameter = 75 mm
bearing length = 75 mm
Journal speed = 3600 rpm.
radial clearance = 0.15 mm
inlet temperature = 40°
Temperature viscocity relationship is

T(°C)	40	41	42	43	44	45	46	47	48
Z (Cp)	52.5	50	47.5	45	43	41	39	37.5	36

Assume that total heat produced in bearing is carried by total oil flow. Specific gravity and specific heat of lubricant are 0.86 and 1.76 kJ/kg°C respectively. Calculate power lost in friction and requirement of oil flow. **[10]**

l/d	E	$\left(\frac{ho}{c}\right)$	S	ϕ	$\left(\frac{r}{c}\right)F$	$\frac{Q}{rCn_s l}$	$\frac{Q_s}{Q}$	$\frac{P}{P_{max}}$
	0.1	0.9	1.33	79.5	26.4	3.37	0.150	0.540
	0.2	0.8	0.631	74.02	12.8	3.59	0.280	0.529
1.0	0.4	0.6	0.264	63.1	5.79	3.99	0.497	0.484
	0.6	0.4	0.121	50.58	3.22	4.33	0.68	0.415
	0.8	0.2	0.0446	36.24	1.70	4.62	0.842	0.313
	0.9	0.1	0.0188	26.45	1.05	4.74	0.919	0.247
	0.97	0.03	0.00474	15.47	0.514	4.82	0.973	0.152
	1.0	0	0	0	0	0	1.0	0

b) Write desirable properties of bearing material. **[6]**

OR

Q4) a) State assumptions made in petroffs equation and derive it. **[8]**

b) State assumptions made in deriving 'Reynold's equation'. **[4]**

c) Sketch pressure distribution in infinitely short hydrodynamic journal bearing. **[4]**

Unit - III

Q5) a) A transmission shaft carries pulley midway between two bearings. Bending moment at the pulley varies 200 N-m to 600 N-m. And torsional moment in shaft varies from 70 N-m to 200 N-m. The frequencies of variation of bending and torsional moments are equal to shaft speed. The shaft is made of steel having Sut = 540 N/mm^2 & Syt = 400 N/mm^2. Corrected endurance limit of shaft is 200 N/mm^2. Determine diameter of shaft using 'Distorsion energy theory'. Take factor of safety 2. Use modified goodman diagram for design. **[12]**

b) Explain terms notch sensitivity and endurance limit. **[4]**

OR

Q6) a) With neat sketches explain methods of reduction of stress concentration. **[6]**

b) The section of steel shaft is shown in fig.1 the shaft is machined by turning process. The section at X - X is subjected to constant bending moment of 500 kN - M. The shaft material has ultimate tensile strength of 500 MN/m^2 and yield strength 350 MN/m^2. Endurance limit for standard specimen in bending is 210 MN/m^2. The notch sensitivity factor can be taken as 0.8. The theoretical stress concentration factor may be calculated from following values : **[10]**

$\left[\frac{r_F}{d}\right]$	0.025	0.05	0.1
K_t	2.6	2.05	1.66

Where r_F is fillet radius and 'd' diameter of shaft. The reliability is 90%. Determine life of shaft.

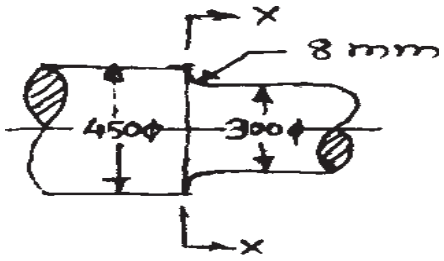

Fig. 1

SECTION - II

Unit - IV

Q7) a) A Centrifugal clutch consists of four shoes each having a mass of 2 kg. The inner radius of the drum is 140 mm. In the engaged position, the distance of the center of gravity of the shoe from the axis of rotation of the spider is 115 mm. The coefficient of friction is 0.25. The spring force at the beginning of the engagement is 1400 N. Calculate. **[8]**

i) The speed at which the engagement begins.

ii) The power transmitted by the clutch at 1200 r.p.m.

b) A single plate clutch is designed to transmit 10 kW power at 2000 r.p.m. The equivalent mass and radius of gyration of the input shaft are 20 kg and 75 mm respectively. The equivalent mass and radius of gyration of the output shaft are 35 kg and 125 mm respectively. Calculate : **[8]**

i) The time required to bring the output shaft to the rated speed from rest.

ii) The heat generated during the clutching operation.

OR

Q8) a) A hoisting system of crane consists of a cable drum of mass 60 kg, the radius of gyration 0.2 m and radius 0.35 m fitted to a cast iron brake drum of mass 20 kg, the radius of gyration 0.25 m and radius 0.425 m. The hoisting capacity of the crane is 20 kN at a speed of 3.2 m/s. The braking is effected by a double block brake with each shoe subtending an arc of 40° on the brake drum. The brake has a capacity to bring the moving load to rest in 4 m of height. The coefficient of friction between the brake drum surface and the shoe is 0.30. Calculate : **[12]**

i) The amount of heat generated in bringing the load to rest.

ii) The temperature rise of the brake drum, if the specific heat of the brake drum material is 400 J/kg °C

iii) The dimensions of brake shoe, if an alloyable pressure intensity is 1.0 N/mm^2

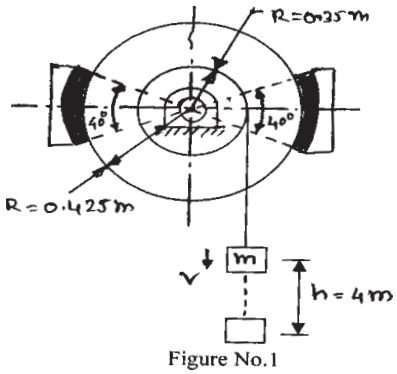

Figure No.1

b) Explain Simple and differential band brake with the help of figures. **[4]**

Unit - V

Q9) a) A spur pinion having 20 teeth to be made of plain carbon steel 40C8 (S_{ut} = 580 N/mm^2) is to be mesh with a gear having 85 teeth to be made of grey cast iron FG260. The gear pair is required to transmit 15 kW power from an Electric motor running at 1440 r.p.m. to a machine. The starting torque required is 200% of rated torque while the load distribution factor is 1.4. The face width is 12 times the module and the tooth system is 20° full depth involute. The gears are to be machined to meet the specifications of Grade 7. The deformation factor C for gear pair is 240 N/mm.

i) If the factor of safety against the bending failure is 1.5, Design the gear pair by using the dynamic factor $C_v = 6/(6 + V)$, (assume V = 10 m/s for initial stages) and Buckingham's equation for dynamic load.

ii) If the factor of safety against the pitting failure is 2.0, Specify the surface hardness.

Use following data :

Lewis form factor Y = 0.484 – 2.87/Z

Load - stress factor, $K = 0.18\left(\frac{BHN}{100}\right)^2$ N/mm^2

For grade – 7, $e = 11.00 + 0.9(m + 0.25\sqrt{D})\mu m$

$P_d = 21V(bC + Pt_{max})/(21V + \sqrt{(bC + Pt_{max})})$

First preference module (mm) – 1, 1.25, 1.5, 2, 3, 4, 5, 6, 8, 10, 12, 16. **[12]**

b) State and explain different types of gear tooth failures, their causes and remedies. **[4]**

OR

Q10) a) The following data is given for the steel helical pair transmitting 150 kW power from a shaft rotating at 1440 r.p.m. to another parallel shaft rotating at 360 r.p.m.

- Center distance = 435 mm approximately.
- Helix angle = 24°
- Face width = 14 m_n
- Z pinion = 20
- Per. Bending stress for pinion material = 152 N/mm^2
- Per. Bending stress for gear material = 125 N/mm^2
- Tooth System = 20° full Depth Involute.
- Service factor = 1.53
- Combined teeth error = 0.0406 mm
- Deformation factor = 11600 eN/mm

Assuming the dynamic load is accounted by Buckingham's equation.

Calculate : **[12]**

i) The factor of safety against bending failure.

ii) The surface hardness if the factor of safety against pitting failure is 1.5.

Use following data :

Z	23	24	25	26	27	75	100	150	200
Y	0.333	0.3362	0.3393	0.3456	0.3487	0.4335	0.4461	0.4587	0.4712

- Where Y - Lewis form factor and Z - no. of teeth.
- $P_d = 21V(bC\cos^2\psi + Pt_{max})\cos^2\psi/(21V + \sqrt{(bC\cos^2\psi + Pt_{max})})$.
- First preference module (mm) – 1, 1.25, 1.5, 2, 3, 4, 5, 6, 8, 10, 12, 16.

b) What is formative number of teeth in helical gears? Derive the expression for formative number of teeth in helical gears. **[4]**

Unit - VI

Q11) a) The dimensions of pair of bevel gears are given in Figure No.2.The Gear G delivers 5 kW power at 500 r.p.m. to the output shaft. The bearings A and B are mounted on the output shaft in such a way that the bearing B can take radial as well as entire thrust load., while bearing A can take only radial load. Determine reactions at the two bearings. [Assume $\alpha = 20°$] **[12]**

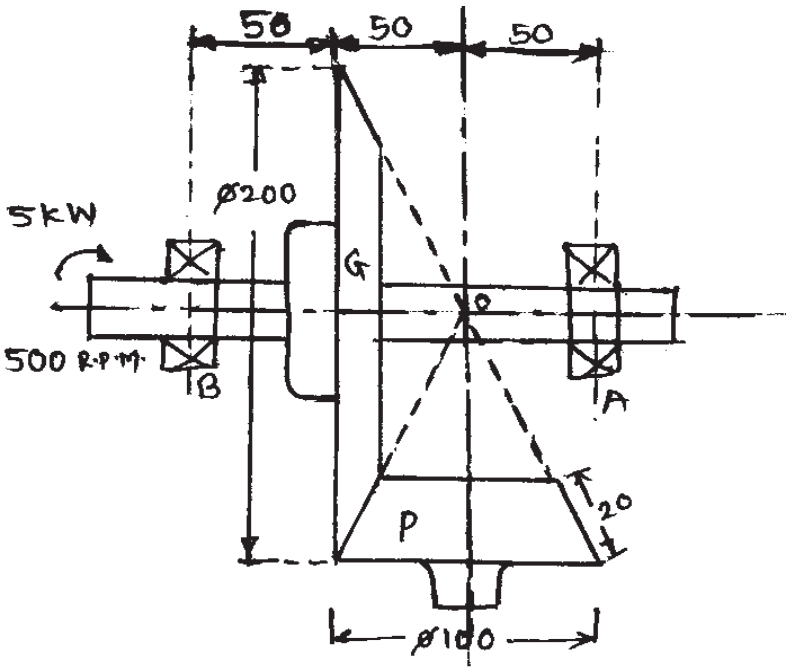

Figure No.2

b) Derive an expression for beam strength of straight bevel gears. **[6]**

OR

Q12) a) A worm gear drive is to be used to obtain a speed reduction of 20.5 from an input speed of 1450 r.p.m. and to transmit 20 kW. The material of worm gear is bronze with per. wear load factor K = 2.4 MPa when center distance is more than 200 mm and worm has hardness of 600 BHN and is ground. Use the data given below.

- Diameter factor = 10
- Service factor = 2
- No. of starts on the worm = 2
- Per. Beam strength for worm gear material = 275MPa
- Coefficient of friction = 0.026
- Vel. Factor = $6/(6 + V_G)$ where V_G in m/s (assume 2.5 m/s initially)
- Form factor Y for normal pressure angle of 14.5° = 0.314
- Worm gear width = 0.73 × worm P.C.D.
- Standard first preference values of module are = 1,1025, 1.6, 2, 2.5, 3.15, 4, 5, 6, 8, 10, 12, 16, 20
- Factor of safety = 1

Design the worm & worm gear drive, Find also Heat losses, would you recommend blower for the gear box. If it is not possible to fit the blower then what will be the new value of module for worm gear will you suggest? **[12]**

b) Derive an expression for efficiency of worm gear drive. **[6]**

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Total No. of Questions : 12]

P1062

SEAT No. : [ ]

[Total No. of Pages : 4

[4163] - 219
T.E. (Mechanical Engg.)
MECHATRONICS
(2008 Pattern) (Sem. - II)

Time : 3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answers any 3 questions from Section - I and 3 questions from Section - II.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Draw the block diagram of generalized measurement system and explain the function of each element. **[6]**

b) What do you understand by active and passive transducers? Explain with suitable example. **[6]**

c) Sensitivity of a thermocouple is 0.01V/°C. Find the output voltage if the temperature is 200°C. Also find temperature for 3.5V output. **[4]**

OR

Q2) a) Explain thin film RTD with its diagram. **[4]**

b) Explain capacitive type level measuring transducer. **[6]**

c) An electrical resistance strain gauge of resistance 120Ω and gauge factor 2 is bonded to a specimen of steel. Calculate the resistance change of the gauge due to stress of 50MN/m^2 (tensile) in the specimen. Modulus of elasticity E = 200GN/m^2. **[6]**

Q3) a) Explain principle and working of LVDT with circuit diagram. **[8]**

b) An optical encoder of 1500 ppr is rotating with a speed of 300rpm. Find out resolution of encoder and frequency of signals. **[4]**

c) Write short note on inductive proximity sensor. **[4]**

OR

P.T.O.

Q4) a) A rotary potentiometer is used for angle measurement. Potentiometer is supplied with 10V and is set at 28°. The range of this single turn pot is 350° calculate the o/p voltage. **[6]**

b) Explain the principle and working of 3 bit absolute optical encoder. **[6]**

c) Write short note on limit switches. **[4]**

Q5) a) A thermocouple gives an output of 0.5mV/°C. What will be the required number of bit when its output passes through an ADC if temperatures from 0 to 200°C are to be measured with a resolution of 0.5°C. **[6]**

b) Explain weighted resistance type digital to analogue converter and also Write its limitations. **[8]**

c) Write down the basic building blocks of Mechanical system. **[4]**

OR

Q6) a) Explain successive approximation type analogue to digital converter. **[8]**

b) Write down the basic building blocks of thermal system. **[4]**

c) Explain SCADA with block diagram. **[6]**

SECTION - II

Q7) a) Explain following terms : **[6]**

i) Process lag

ii) Control lag

iii) Dead time

b) Draw the block diagram of a system having transfer function of forward element is $\frac{1}{2(s+1)}$ and transfer function of negative feedback element is $\frac{1}{s}$. Also find the overall transfer function of control system. **[6]**

c) Differentiate between feedback and feed forward control system. **[4]**

OR

Q8) a) Explain following terms : **[6]**

i) Controlled variable

ii) Process Load

iii) Process equation

b) Find the overall transfer function of a system which consists two elements in series having transfer function $\frac{1}{2s}$ and $\frac{1}{s+2}$ and one positive feedback element of transfer function 10. Also draw the block diagram of system. **[6]**

c) Explain the difference between analogue control and digital control. **[4]**

Q9) a) What are the major disadvantages of two position controller? **[4]**

b) Write down the advantages and limitation of proportional control system. **[4]**

c) A proportional controller is used to control temperature within 50°C to 130°C with a set point of 73.5°C. The set point is maintained with 50% controller output. The offset error is corresponding to load change which causes 55% controller output. If the proportional gain is 2 find the % controller output if the temperature is 61°C. **[8]**

OR

Q10)a) Write a short note on stability of control system. **[4]**

b) Explain why PID control system is most widely used control system. **[6]**

c) Write short note P+I control system. **[6]**

Q11)a) Write a short note on : **[8]**

i) Ladder diagram element.

ii) Relay logic controller.

b) Draw a PLC ladder diagram for a motor with : **[10]**

NO start button

NC stop button

Thermal overload limit switch opens on high temperature

Green light while running

Red light for thermal overload.

OR

Q12)a) Explain working of 555 timer with its pin diagram. **[6]**

b) Construct the ladder logic diagrams for **[12]**

i) OR gate

ii) AND gate

iii) NOT gate

Also develop a truth table for all three logics.

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Total No. of Questions : 12]

SEAT No. :

P1093

[Total No. of Pages : 3

[4163] - 265

T.E. (Electronics)

POWER ELECTRONICS

(Sem. - I) (2008 Pattern)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:-

1) ***Answers 3 questions from section - I and 3 questions from section - II***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) With the help of a neat circuit diagram & relevent waveforms, explain the two quadrant operation of single phase fully controlled bridge convertor. Derive the expression for average o/p voltage & output current. **[10]**

b) A single phase half-controlled bridge converter operates from 115V, 60 Hz mains & supplies a resistive load of 250Ω for firing angle of 45º & 135º. **[8]**

Calculate

i) Average output voltage
ii) RMS output voltage
iii) Load power
iv) RMS supply current

OR

Q2) a) Compare single phase & three phase converters. Explain with circuit diagram & waveforms working of three phase full converter with purely resistive load. Derive the equation of average output voltage. **[10]**

b) Define triggering circuit. What are the different types of triggering methods. Explain any one in detail. **[8]**

P.T.O

Q3) a) What are the types of choppers. Explain in detail first quadrant or type A chopper. Derive the equation of average output voltage & average output current. **[8]**

b) For type A chopper or step down chopper, DC source voltage is 230 V, Load resistance is 15Ω. Take a drop of 2V across chopper when it is on. For a duty cycle of 0.4, calculate. **[8]**

i) Average & rms values of output voltage

ii) Chopper efficiency

OR

Q4) a) Explain the operation of Buck-Boost converter. Derive the equation of average output voltage. **[10]**

b) Compare linear, switched mode & resonant converters. **[6]**

Q5) a) What is resonant converter? Compare ZVS & ZCS converters. **[8]**

b) Explain with circuit diagram & waveform operation of SLR half bridge DC to DC converter. **[8]**

OR

Q6) a) Explain the operation of 1ϕ to 1ϕ cycloconverter with neat circuit diagram. & explain how you get the output frequency equals to 1/4 of input frequency. **[10]**

b) Eloborate the applications of cycloconverters. **[6]**

SECTION - II

Q7) a) Draw & Explain series resonant inverter with unidirectional switches. **[10]**

b) What are the methods for voltage controlled with in the single phase inverter. Explain any one. **[8]**

OR

Q8) a) Explain operation of three phase transistorized inverter for resistive star connected load. Draw retevent waveforms with 180º conduction mode. **[10]**

b) Explain sinusoidal pulse width modulation technique used in inverter. **[8]**

Q9) a) What are the advantages & disadvantages of water cooling & oil colling. **[8]**

b) What is the need of fuse for semiconductor devices. & What are the considerations taken into account while selecting a fuse for semiconductor device. **[8]**

OR

Q10) Write a short note on (any two) : **[16]**

a) Heat Sink

b) Twelve pulse converter for HVDC

c) Vapour phase cooling

Q11) a) Explain sequence control of single phase converter. **[8]**

b) Explain types of power line disturbances. **[8]**

OR

Q12) a) Explain in detail measurement of power line disturbances. **[8]**

b) What is importance of power factor. Explain excitation angle control method for the power factor improvement. **[8]**

Total No. of Questions : 12]

SEAT No. :

P1094

[Total No. of Pages : 3

[4163] - 266
T.E. (Electronics)
DRIVES & CONTROLS
(2008 Pattern) (Sem. - II)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:-

1) ***Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6 from section I and Q.7 or Q. 8, Q.9 or Q.10, Q.11 or Q.12 from section II .***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, & non programmable electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) With the help of a neat circuit diagram and waveforms, explain the operation of three phase full converter drive for separately excited DC motor. **[10]**

b) Explain ideal dual converter. Mention the assumptions for the ideal dual converter. Derive the relation between the firing angles of the two converters to obtain same voltage at the output terminals. **[8]**

OR

Q2) a) Under which conditions the armature current of a separately excited DC motor becomes discontinuous? What are the effects of this discontinuous current on the operation of the drive? **[6]**

b) Why field failure protection is important for DC motors? Explain a suitable scheme using simple circuit diagram to provide this protection to a DC motor. **[6]**

c) Explain the operation of a two quadrant DC drive using chopper. **[6]**

P.T.O

Q3) a) Explain the operation of a microprocessor based DC drive using simple block / circuit diagram. Explain the use of software to control the above drive. **[10]**

b) What is braking? Explain dynamic braking of DC machine. Mention its advantages and disadvantages. **[6]**

OR

Q4) a) Explain closed loop control of a DC drive using simple schematic diagram and transfer functions. **[10]**

b) Explain how the DC motor can be controlled using PLL? **[6]**

Q5) a) Explain the use of current source inverter (CSI) for speed control of induction motor. **[8]**

b) With the help of a neat circuit diagram, explain the static Scherbius drive for Induction motor control. **[8]**

OR

Q6) a) Explain the necessity of soft acceleration and soft deceleration in case of an Induction motor. **[6]**

b) With the help of neat diagram explain the rotor resistance control scheme for induction motor. Mention its advantages and disadvantages. **[10]**

SECTION - II

Q7) a) Draw and explain torque versus torque angle characteristics of synchronous motor with salient pole rotor. **[8]**

b) Draw and explain block diagram of self controlled synchronous motor fed from 3-phase inverter. **[10]**

OR

Q8) a) Explain briefly the operation of cylindrical rotor synchronous motor. Also derive the expression for field excitation. **[10]**

b) Explain the following terms related to synchronous motor: **[8]**

i) Pullout torque

ii) Starting torque

iii) e- curve

Q9) a) With the help of diagram, explain the operation of a Permanent Magnet Stepper motor. **[8]**

b) Draw and explain various power converter configurations for one phase of a Switched Reluctance Motor. **[8]**

OR

Q10) a) With the help of a circuit diagram and necessary waveforms, explain the operation of a stepper motor driver circuit. Mention the advantages and disadvantages of the scheme used by you. **[8]**

b) With the help of a neat circuit diagram and waveforms explain the operation of 3 phase half wave brushless dc motor drive. **[8]**

Q11) a) Write a short note on Traction drive. **[8]**

b) Explain the operation of fuzzy logic based wind generation system. **[8]**

OR

Q12) a) Explain the operation of Neural network based PWM controller. **[8]**

b) Explain 'Tuning of a controller' for a drive system. **[8]**

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Total No. of Questions : 12]

SEAT No. : ____

P1095

[Total No. of Pages : 3

[4163] - 267

T.E. (Electronics)

SENSORS & INTERFACES

(2008 Pattern) (Sem. - II)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain pH measurement with neat diagram. **[8]**

b) Explain selection criterion for choosing a sensor/transducer. **[8]**

OR

Q2) a) Explain incremental and absolute rotary encoders for angular velocity measurement. **[8]**

b) Explain principle of flow measurement. Describe Pitot tube used for flow measurement. **[8]**

Q3) a) A sensor outputs a range of 10 to 200 mV, as a variable varies over its range. Develop a signal conditioning circuit using 3 OP AMP instrumentation amplifier so that it becomes 0 to 5 V. **[8]**

b) Explain with neat diagram I/P converter and P/I converter. **[8]**

OR

P.T.O.

Q4) a) Explain any one technique for level and humidity measurement. **[8]**

b) Write a short note on SMART transmitter. **[8]**

Q5) a) List the features of PIC micro controller. Draw and explain interface of 4×4 matrix keyboard with PIC 16F84. **[10]**

b) Explain selection criteria for ADCs related to sensor interfacing. **[8]**

OR

Q6) a) Draw and Explain interfacing of 89C51 microcontroller with LCD and relay. **[10]**

b) State the different types of DACs and state their specifications. **[8]**

SECTION - II

Q7) a) Write short note on foundation field bus. **[8]**

b) Explain HART communication protocol along with its modes of operation. **[8]**

OR

Q8) a) Write short note on I^2C bus. **[8]**

b) Explain with block diagram computer based data logger. **[8]**

Q9) a) Explain following types of valves with neat diagram:

i) Spool valve ii) Poppet valve **[8]**

b) Explain with neat diagram Pressure control valves. **[8]**

OR

Q10) a) Explain lift system to move the load up and down using pneumatic actuators. **[8]**

b) Explain principle of operation of D.C. motor. State various types of D.C. motor. **[8]**

Q11) a) Draw and explain architecture of PLC. Compare PLC with a personal computer. State important specifications of PLC. **[10]**

b) Develop a ladder diagram for a circuit that can be used to start a motor and then after delay of 100 sec. start a pump. When the motor is switched off there should be a delay of 10 sec. before the pump is switched off. **[8]**

OR

Q12) Write short note on : **[18]**

a) Selection of PLC.

b) Input and output devices for PLC

c) Analog Input / Output for PLC

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Total No. of Questions : 12]

SEAT No. :

P1096

[Total No. of Pages : 4

[4163] - 268

T.E. (Electronics)

MICROCOMPUTER BASED SYSTEMS

(2008 Pattern) (Sem. - II)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer three questions from section-I and three questions from section-II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule,Mollier charts electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain the function of the following pins of 8086 microprocessor. **[8]**

i) $M/\overline{IO}$ ii) $L\overline{OCK}$

iii) $DT/\overline{R}$ iv) INTR

b) The contents of different registers of 8086 are given below. Find out the effective addresses for the **[10]**

i) Direct

ii) Register indirect

iii) Register relative

iv) Based indexed

v) Relative based indexed addressing modes

Offset (displacement)= 4000H

[AX] = 1000H [BX] = 2000H [SI] = 3000H [DI] = 4000H [BP] = 5000H [SP] = 6000H [CS] = 0000H [DS] = 1000H [SS] = 7000H [IP] = 7000H

OR

P.T.O

Q2) a) Draw and explain timing diagram for 8086 read and write cycle in minimum mode. **[8]**

b) What is maximum mode in 8086? Explain the functions of different pins associated with maximum mode. **[10]**

Q3) a) Write assembly language program for addition of two 3 × 3 matrices. The matrices are stored in the form of lists (row wise). Store the result of addition in the third list. **[8]**

b) Draw and explain interrupt structure of 8086 in detail. **[8]**

OR

Q4) a) Write program in assembly language of 8086 to compare the stored password in the string 1 and recently input password in the string2. If password do not match display message "Password not matching, Please try again". If matches display message "Proceed". Use suitable DOS interrupts and assume that passwords are already stored. **[8]**

b) Explain with suitable examples the following instructions of 8086 microprocessor. **[8]**

i) CLD

ii) ESC

iii) LOOPZ

iv) SHR

Q5) a) What is segment descriptor in 80386? Explain its format? How physical address is calculated using descriptors in GDT and selectors? **[8]**

b) Draw and explain in detail the flag register of 80386. **[8]**

OR

Q6) a) What is paging in 80386? Explain how physical address is generated using paging? **[8]**

b) What do you mean by privilege levels in 80386? Explain how privilege levels are changed? **[8]**

SECTION - II

Q7) a) State and explain the features of USB interface. What are the different transfer types in USB. **[10]**

b) List the specifications of the PCI bus. **[8]**

OR

Q8) a) Draw and explain block diagram of motherboard with Pentium processor. **[10]**

b) Explain with timing diagram the communication between centronics printer with parallel port. **[8]**

Q9) a) What is role of barrel shifter in ARM processor? List different barrel shifter operations carried out in ARM core. **[8]**

b) Explain the following instructions of ARM processor. **[8]**

i) SWI ii) LDR

iii) BL iv) MLA

OR

Q10) a) What are privileged and non-privileged modes in ARM processor? List and explain the different privileged modes. **[8]**

b) Explain 3 stage and 5 stage pipeline in ARM processors. **[8]**

Q11) Design a close loop DC motor control system using 8086/8088 microprocessor. The motor is controlled through a 4 quadrant chopper which uses IGBT as switching devices. The feedback is taken through a tacho generator whose output is 0.02V DC per revolutions per minute (rpm). Assume that suitable attenuation and isolation is available in feedback loop. The output after attenuator is 1V /1000rpm and maximum motor speed is 3000 rpm. Interface suitable analog to digital convertor through Input/Output port. The reference speed is entered through numeric keyboard. Use optoisolator for isolation between microprocessor output port and chopper. Draw the complete interface diagram and flow chart explaining the speed control process. Use suitable peripheral interface chips and assume suitable data wherever necessary. **[16]**

OR

Q12) Design 8 channel data acquisition system to sense upto 8 physical parameters like Temperature, pressure etc using 8086/8088 microprocessor. Use suitable peripheral devices for Input and Output. The data size is 8 bit. The measured values will be displayed on the 3 seven segment LED interface. Also the measured data is transmitted over RS232 interface with parallel to serial convertor and suitable 232 standard convertor to the personal computer. Draw the complete interface diagram and algorithm explaining the data acquisition process. Assume that suitable signal conditioning circuitry is designed and can be presented as block. **[16]**

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Total No. of Questions : 12]

SEAT No. :

P1100

[Total No. of Pages : 4

[4163] - 272

T.E. (E&TC)

DIGITAL COMMUNICATION

(Sem. - I) (2008 Pattern)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:-

1) ***Answer 3 questions from section - I and 3 questions from Section - II.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What is a digital baseband system? Explain how a textual data is encoded using ASCII and Baudot codes with suitable examples. **[8]**

b) The spectrum of the signal g (t) is shown in Fig. 1. below. This signal is naturally sampled with periodic team of rectangular pulses of duration $\frac{50}{3}$ m secs. Plot the spectrum of sampled signal for frequencies upto 100 Hz for the following two conditions. **[10]**

i) f_s = Nyquist Rate

ii) f_s = 20 samples/sec.

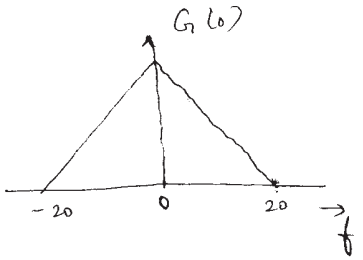

Fig ①

OR

Q2) a) What are the advantages of DM over PCM in Terms of signalling rate and bandwidth requirement. Derive the output S/N ratio of delta modulator. Brief the condition to avoid slope overload error. **[8]**

P.T.O

b) Consider an audio signal with spectral components limited to the frequency band of 500 Hz to 3kHz. A PCM signal is generated with sampling rate of 8000 samples/sec. The required output signal to quantisation noise ratio is 40 dB.

i) How many number of levels and no of bits/level are needed for uniform quantisation.

ii) Calculate the bandwidth requirement of the above system.

iii) If A-law compander is used, what will be the changes in the number of levels, no. of bits / sample and bandwidth? **[10]**

Q3) a) What are line codes and its characteristics? Compare the power spectral density of Unipolar NR2 and R2 formats by deriving suitable expressions. **[8]**

b) Why synchronization is necessary in digital communication? Explain bit and frame synchronization using suitable sketch. **[8]**

OR

Q4) a) Consider the sequence of 1^s nad 0^s

i) An alternate sequence of 1^s and 0^s

ii) A continuous sequence of five 1^s followed by five 0^s.

iii) A sequence of two 1^s followed by ten 0^s sketch the Manchester format representation for the above sequence and comment on the error detection capability. **[8]**

b) What is intersymbol interference? Explain its causes and remedies to avoid it. **[8]**

Q5) a) Explain in detail about stationary, non stationary, wide sense stationary and ergodic processes with suitable mathematical expressions and examples. **[8]**

b) Consider a random process $s(t) = \cos(w_0 t + \phi)$ where 'ϕ' is a random variable with probability density

$$f(\phi) = \frac{1}{2\pi} \quad -\pi \leq \phi \leq \pi$$

$$= 0 \text{ elsewhere}$$

i) Show that the first and second moments of s(t) are independent of time.

ii) If the random variable is fixed as ϕ_0, will the ensemble mean of s(t) be time independent? **[8]**

OR

Q6) a) Define the power spectral density and auto-correlation function of periodic signals. Show that both are related in frequency domain. **[8]**

b) A random process g(t) has power spectral density G(f) = $\eta/2$ for $-\infty \leq f \leq \infty$. The random process is passed through a low pass filter with transfer function H(f) = 2 for $-f_m \leq f \leq f_m$. and H(f) = 0 otherwise. Find the psd of the waveform at the output of filter. **[8]**

SECTION - II

Q7) a) Explain M-ary PSK transmitter and receiver with suitable block diagram and waveforms. What are the advantages of M-ary PSK over M-ary FSK? **[8]**

b) Derive and draw the spectrum of BPSK, QPSK and BFSK signal and compare their bandwidths. **[8]**

OR

Q8) a) Explain the performance of MSK with suitable block schematic and also explain how phase continuity is maintained in this system? **[8]**

b) Explain BFSK transmitter and receiver with a proper sketch. What are the salient features of BFSK signal? **[8]**

Q9) a) Derive the expressions for signal to noise ratio and error probability of a matched filter in the presence of white gaussian noise. **[8]**

b) A received signal of either +2V or –2V held for a duration 'T' is corrupted by white gaussian noise of power spectral density 10^{-4} volts^2/Hz. If the signal is processed by integrate and dump receiver, what is the maximum duration 'T' during which the signal must be sustained if the probability of error is not to exceed 10^{-4}? **[8]**

OR

Q10) a) Derive the relation between bit error rate and Symbol error rate. **[8]**

b) Calculate the error probability in the detection of BPSK, QPSK and BFSK signals using signal space representation and compare their performance with respect to this criteria. **[8]**

Q11) a) Explain DS - SS BPSK transmitter and receiver with suitable block diagram and derive the power spectral density of the same. **[8]**

b) A DS - SS BPSK system has f_b = 3kbps, $N_o = 10^{-10}$ w/Hz and is receiving signals with $P_e \approx 10^{-7}$ in the presence of single tone jammer whose received power is ten times larges than original signal. Calculate the jamming margin and draw the antijam characteristics. **[10]**

OR

Q12) Write short notes on any three : **[18]**

a) TDMA and CDMA services.

b) Satellite Transponder.

c) Noise temperature and G/T ratio.

d) Diversity Techniques.

Total No. of Questions : 12]

SEAT No. :

P1101

[Total No. of Pages : 4

[4163] - 273

T.E. (E&TC)

NETWORK SYNTHESIS & FILTER DESIGN

(Sem. - I) (2008 Pattern)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:-

1) ***Attempt Q.No.1 or Q.No.2, Q.No.3 or Q.No.4, Q.No.5 or Q.No.6 from Section I and Attempt Q.No.7 or Q.No.8, Q.No.9 or Q.No.10, Q.No.11 or Q.No.12 from Section II.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic Pocket Calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Test whether following Polynomial is Hurwitz or not. **[4]**

$$P(s) = S^4 + S^3 + 4S^2 + 2S + 3$$

b) What is positive real function? Give necessary and sufficient conditions for a function to be Positive real function. **[6]**

c) Test whether following functions are positive real function. **[8]**

i) $F_1(s) = \dfrac{2s^2 + s + 2}{s^2 + s + 2}$

ii) $F_2(s) = \dfrac{s^2 + 4}{s^3 + 3s^2 + 3s + 1}$

OR

Q2) a) What is the difference between a Network analysis and Network synthesis? **[4]**

b) Check whether following polynomials are Hurwitz : **[8]**

i) $P(S) = 2S^4 + S^3 + 2S^2 + 4S + 1$

ii) $P(S) = S^3 + 2S^2 + 4S + 1$

c) State the properties of Hurwitz polynomial. **[6]**

P.T.O

Q3) a) Give the properties of driving point L-C impedance functions. **[4]**

b) Realize the following function into Cauer-I and Cauer-II forms. **[8]**

$$Z(s) = \frac{s^4 + 10s^2 + 9}{s^3 + 4s}$$

c) Realize the following function into Foster-II form. **[4]**

$$Y(s) = \frac{s(s+2)}{(s+1)\,(s+4)}$$

OR

Q4) a) Find first and second foster forms of network for the impedance, **[8]**

$$Z(s) = \frac{s(s^2 + 3)}{(s^2 + 1)\,(s^2 + 4)}$$

b) Find Cauer-I forms of network for the function, **[4]**

$$y(s) = \frac{s^2 + 7s + 10}{s^2 + 4s + 3}$$

c) State the properties of RC driving point function of one port network. **[4]**

Q5) a) Realize the following function as symmetrical constant resistance lattice network terminated by 1Ω. **[6]**

$$\frac{V_o}{V_s} = \frac{1}{2}\,\frac{S^2 - 3S + 2}{S^2 + 3S + 2}$$

b) Write a short note on Zeros of Transmission. **[4]**

c) Derive the condition for lattice network to be a constant resistance network. **[6]**

OR

Q6) a) Realize the following function as symmetrical lattice network. **[8]**

$$H(S) = \frac{V_o}{V_s} = \frac{s^2 - s + 1}{s^2 + s + 1}$$

b) Synthesize following into L-C ladder network with ls termination. **[8]**

$$Z_{21}(s) = \frac{s^3}{s^3 + 3s^2 + 4s + 2}$$

SECTION - II

Q7) a) Design second order Butterworth active low pass filter with cut-off frequency 1.8 kHz. Use Sallen key configuration. **[6]**

b) Find the transfer function of normalized third order (3^{rd}) low pass Butterworth filter. Plot pole zero plot of function. **[6]**

c) Write a short note on frequency transformation. **[6]**

OR

Q8) a) Synthesize n=3 (3^{rd} order) **[8]**

i) Band pass filter

ii) Band elimination filter with Butterworth filter approximation amplitude response with ω_{c2}=80 kHz and ω_{c1}=20 kHz.

b) Design third order Butterworth approximation high pass filter with cut-off frequency $\omega_0=10^6$ rad/sec and impedance level of 500 Ω Using frequency transformation. **[6]**

c) State the equations to find Chebyshev cosine polynomials. Find the Chebyshev polynomials for n=2, n=3 and n=4. **[4]**

Q9) a) What is Biquadratic function? List important properties of it. **[4]**

b) Synthesize the following high pass filter using RC to CR transformation where K is arbitrary constant.

$$T_{(HP)}(s) = K\ S^2/(S^2+S+25)$$ **[6]**

c) Synthesize second order LPF to have pole frequency 2 kHz and pole Q of 10 using Sallen and Key circuit and design 3 i.e. saraga design. **[6]**

OR

Q10) a) Synthesize a second order band pass filter with center frequency at 1000 rad/sec and pole Q of 10, the gain at the center frequency is required to be 0 dB. **[6]**

b) Write a short note on : **[10]**

i) Gyrator for inductor substitution.

ii) FDNR

Q11) a) What is sensitivity? Write the properties of sensitivity function. **[4]**

b) For the network with R, L and C elements connected in parallel across the current source I find transfer function and compute sensitivity of Q_p, ω_p and K with respect to passive elements R,L and C. **[12]**

OR

Q12) a) What are the different factors affecting the gain sensitivity? Explain them. **[8]**

b) Explain briefly the effect of op amp characteristics on the active filter performance. **[8]**

Total No. of Questions : 12]

SEAT No. :

P1102

[Total No. of Pages : 3

[4163] - 274

T.E. (E&TC)

MICROCONTROLLER AND APPLICATIONS

(2008 Pattern) (Sem. - I)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:-

1) ***Answer any 3 questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain sleep mode and power down mode of microcontroller. Explain reset circuit of microcontroller. **[8]**

b) State family members and resources of 8051 microcontroller series. **[8]**

OR

Q2) a) Differentiate between Microcontroller and Microprocessor. **[8]**

b) Explain how will you select a microcontroller for a particular application? **[8]**

Q3) a) Interface 16 Kbyte external EPROM to 8051. Find its address range. **[8]**

b) Explain mode 0 and mode 1 of timer in 8051. **[8]**

OR

Q4) a) Draw a timing diagram for read and write operation for interfacing external RAM memory to 8051. **[8]**

b) With the help of port structure explain why it is necessary to send logic one on port pin before performing read operation. **[8]**

P.T.O

Q5) a) Explain following instructions : **[10]**

i) MOVX

ii) MOVC

iii) ACALL

iv) POP

v) JNZ

b) Explain following : **[8]**

i) Editor

ii) Assembler

iii) Simulator

iv) Embedded C

OR

Q6) a) State and explain different addressing modes of 8051 with the help of example. **[10]**

b) With the help of neat block diagram explain the operation of logic analyzer. **[8]**

SECTION - II

Q7) a) Draw sequence diagram for performing read and write operation to interface following devices with microcontroller using 12C: **[8]**

i) ADC

ii) DAC

b) Interface 8 bit DAC to microcontroller 8051 and write an assembly language program to generate staircase wave shown in figure 1. **[8]**

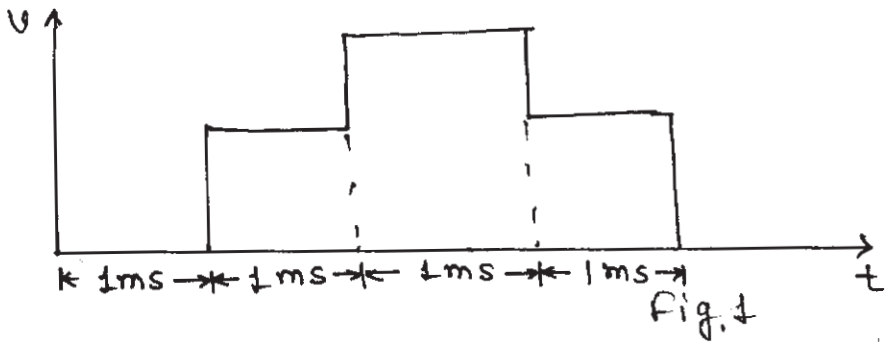

Fig. 1

OR

Q8) a) Interface 16X2 LCD to 8051 and write an assembly language program to display string "WELCOME" from 5th character position on first line using 8 data lines. **[8]**

b) Draw interfacing diagram and flowchart to interface 4x4 matrix keyboard to 8051 microcontroller. **[8]**

Q9) a) Draw and explain program memory map and stack of PIC microcontroller. **[8]**

b) Write a program in C for PIC microcontroller to toggle alternate bits of PORT B continuously with 250 ms delay. **[8]**

OR

Q10) a) Explain data memory organization of PIC microcontroller, also explain use of bank select register. **[8]**

b) Write a C program to get a byte of data from Port C. If it is less the 1000, send it to Port B otherwise send it to port D after some delay. **[8]**

Q11) Design a system to interface LM 35 to 89c51/ PIC microcontroller. Draw complete system diagram. Draw flowchart and write C/assembly language program to read and display temperature on LCD. **[18]**

OR

Q12) Design a system to interface load cell to 89c51/PIC microcontroller. Draw complete system diagram. Draw flowchart and write C/assembly language program to calculate and display weight on LCD. **[18]**

Total No. of Questions : 12]

SEAT No. : ____

P1103

[Total No. of Pages : 4

[4163] - 275

T.E. (E&TC)

DIGITAL SIGNAL PROCESSING

(Sem. - I) (2008 Pattern)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:-

1) ***Answer any 3 questions from each Section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Your answers will be valued as a whole.***
6) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
7) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Draw Direct form - I and Direct form - II structures for the following systems. **[12]**

i) $y(n)-\frac{3}{4}y(n-1)+\frac{1}{8}y(n-2)=x(n)+\frac{1}{2}x(n-1)$

ii) $y(n)=0.5[x(n)+x(n-1)]$

iii) $y(n)-6y(n-1)=8x(n)$

b) Explain the aliasing effect for a signal which is sampled below the Nyquist rate. **[3]**

c) Consider the analog sinusoidal signal **[3]**

$x(t) = 5 \sin (500 \pi t)$

i) If the signal is sampled at Fs = 1500 Hz, what is the discrete time signal obtained after sampling.

ii) Find the frequency of discrete time signal.

iii) Sampling frequency Fs = 300 Hz.

OR

P.T.O

Q2) a) Determine the impulse & unit step response of the system described by the difference equation. **[12]**

i) $y(n)-3y(n-1)-4y(n-2)=x(n)+2x(n-1)$

ii) $y(n)=0.6y(n-1)-0.08y(n-2)+x(n)$

b) Test the system $y(n)=x(-n+2)$ for causality, linearity & time Invariance. **[6]**

Q3) a) Obtain DTFT & sketch the magnitude spectrum for $x(n)=u(n)-u(n-4)$. **[4]**

b) For a given sequence **[8]**

$x(n)=\{1, 2, 3, 1\}$ & $h(n)=\{4, 3, 2\}$

Find i) Linear convolution

ii) Circular convolution (show the graphical representation atleast for one calculation)

c) Explain the circular time shif property of DFT. **[4]**

OR

Q4) a) Show and compare computational complexity is reduced if 16 point DFT is computed using Radix - 2 DIT FFT algorithm. **[6]**

b) Find 8 point DFT using Radix - 2 DIF FFT algorithm for a given sequence **[10]**

$x(n)=\{-1, 0, 2, 0, -4, 0, 2, 0\}$

Q5) a) Causal system has difference equation

$y(n)=0.5\,y(n-1)-0.25\,y(n-2)+x(n)$

What is the ROC of the transfer function of the system **[8]**

b) Impulse response of a system is

$$h(n)=\left(\frac{1}{3}\right)^n \qquad n=0, 1, 2, 3$$

$$=0 \qquad \text{other wise}$$

Find the response of a system to step input. **[8]**

OR

Q6) a) The system is characterized by

$$H(z) = \frac{3 - 4z^{-1}}{1 - 3.5z^{-1} + 1.5z^{-2}}$$

Determine $h(n)$ for the following condition

i) system is causal

ii) system is stable

iii) system is non-causal **[8]**

b) Draw pole-zero plot and sketch the magnitude response of the system having following transfer function. Also comment on the nature of the magnitude response. **[8]**

i) $H(z) = \frac{1 - 2z^{-1}}{1 + 3z^{-1} + 9z^{-2}}$

ii) $H(z) = \frac{1 + z^{-1} + z^{-2}}{3}$

SECTION - II

Q7) a) A digital IIR LPF is required to meet the following specifications. **[8]**

pass band ripple : ≤ 1 dB

pass band edge : 4 kHz

stop band attenuation : ≥ 40 dB

stop band edge :6 kHz

sample rate : 24 kHz

The filter has to be designed using Bilinear transformation. Find the order, out off frequency & pole locations in case of Butterworth filter.

b) Explain in detail w.r.t. FIR filter. **[10]**

i) Linear phase

ii) Frequency sampling method.

OR

Q8) a) Convert the analog filter with system function

$$H_a(S) = \frac{S + 0.1}{(S + 0.1)^2 + 9}$$

into digital IIR filter by means of

i) Impulse Invariance transformation method.

ii) Bilinear Transformation method. **[8]**

b) i) Compare FIR and IIR filter. **[5]**

ii) Comment on the causality of Ideal Digital filter. **[5]**

Q9) a) Explain sampling rate conversion by non-integer factor. **[8]**

b) Explain application of DAC in compact Hi-Fi system. **[8]**

OR

Q10) a) Explain Upsampling. Derive the expression for interpolated output signal. **[8]**

b) What is need of polyphase interpolation? Explain in detail polyphase interpolator. **[8]**

Q11) a) Explain desirable features of TMS 320 C67 XX series DSP processor. Draw architectural block diagram of it. **[8]**

b) Explain in detail role of DSP in speech signal processing. **[8]**

OR

Q12) a) Explain pipelining concept, MAC unit and Barrel shifter of DSP processor. **[8]**

b) Compare DSP processor with conventional microprocessor. What is use of DAG1 & DAG2? **[8]**

Total No. of Questions : 12]

SEAT No. :

P1105

[Total No. of Pages : 3

[4163] - 277

T.E. (E&TC)

SYSTEM PROGRAMMING & OPERATION SYSTEMS

(2008 Pattern) (Sem. - II)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:-

1) ***Answer 3 questions from Section I and 3 questions from Section II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain fundamentals of language processing and language processor phases in detail. **[8]**

b) Explain top down parsing with out back tracking. Show parsing steps of < id > + < id > ∗ < id > according to following grammar. **[8]**

E : : = T E″

E″ : : = + E | E

T : : = VT″

T″ : : = ∗ T | E

V : : = < id >

c) Why lexical and syntax analyzer are separated out. **[2]**

OR

Q2) a) Explain Lexical Analysis, Syntax Analysis and semantic Analysis with example. **[6]**

b) Explain Design of Two Pass Assembler in detail. **[8]**

c) How literals are processed by assembler which doesnot support immediate operands. **[4]**

Q3) a) Explain advance macro facilities to alter flow of control during expansion and expansion time variables with examples. **[8]**

P.T.O

b) Explain compilation of control structure for if statement and while statement. **[8]**

OR

Q4) a) Explain design of two pass macro processor. **[8]**

b) Explain code optimization with suitable example. **[8]**

Q5) a) Compare Absolute loader and compile-and-go loader. **[4]**

b) Explain program relocation in detail and how relocation is performed. **[4]**

c) Explain software tools for program development **[8]**

OR

Q6) a) Explain Two Pass Design of Direct Linking Loader with suitable diagram showing database. **[8]**

b) Explain implementation of MS DOS Linker in detail. **[8]**

SECTION - II

Q7) a) What is Real Time operating system? Compare hard Real Time system and Soft Real Time system. **[8]**

b) What is the purpose of system calls in an operating system? List types of system calls and Explain any one of them. **[8]**

OR

Q8) a) What is scheduling and scheduling criteria? What are different types of scheduling? Explain any one in detail. **[8]**

b) What are deadlocks? Describe in brief various methods for deadlock prevention. **[8]**

Q9) a) Explain the difference between internal and external fragmentation. Which one occurs in paging systems? Which one occurs in systems using pure segmentation. **[4]**

b) Consider a demand paging system with following time - measured utilizations : **[6]**

CPV utilization 20%

Paging disk 97.7%

Other I/O devices 5%

For each of the following, say whether it will (or is likely to) improve CPU utilization.

Explain your answers :

i) Install a faster CPU
ii) Install a bigger paging disk
iii) Increase the degree of multi programming
iv) Install more main memory
v) Add pre-paging to the Page-fetch algorithms.
vi) Increase page size

c) Given five memory partitions of 100KB, 500KB, 200KB, 300KB and 600KB (in order), how would each of the First-fit, Best-fit and worst-Fit algorithms place processes of 212KB, 417KB, 112KB and 426KB (in order)?
Which algorithm makes the most efficient use of memory? **[6]**

OR

Q10) a) Explain the concept of segmentation. **[4]**

b) Explain demand paging and Hardware support required to support Demand paging. **[4]**

c) A computer has four page frames. The time of loading, time of last access and the R and M bits for each page are shown below (the time are in clock ticks) **[8]**

Page	Loaded	Last Ref.	R	M
0	126	280	1	0
1	230	265	0	1
2	140	270	0	0
3	110	285	1	1

i) Which page will NRU replace?
ii) Which page will FIFO replace?
iii) Which page will LRU replace?
iv) Which page will second chance replace?

Q11) Write short notes on : **[18]**

a) Directory structure.
b) Memory management in unix
c) Disk space management

OR

Q12) Write short notes on : **[18]**

a) Interrupt processing for I/O.
b) File management system.
c) Disk scheduling with the help of scan scheduling and shortest seek time, First scheduling.

✪✡✪✡

Total No. of Questions : 12]

SEAT No. : ____

P1116

[Total No. of Pages : 4

[4163] - 302
T.E. (Chemical)
MASS TRANSFER - I
(2008 Pattern) (Sem. - I)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer 3 questions from section - I and 3 questions from section - II.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Derive the expression to calculate the flux of steady state diffusion of A through non diffusing B. **[4]**

b) What is mass transfer? Define moleculor diffusion and Fick's law of diffusion. **[4]**

c) A glass tube of 1mm bore was filled with acetone to within 2.3 cm of the top and maintained at temperature of 18.8°C in a gentle current of air. The position of liquid surface was measured with travelling microscope. After eighty minute the level had fallen by 0.148 cm. Calculate the diffusivity of acetone in air.

Data : Vapor pressure of acetone at 18.8°C = 170 mmHg Barometric pressure = 765.5 mmHg & M = 58.1. **[8]**

OR

Q2) a) Explain Maxwell's law of diffusion. **[6]**

b) Ammonia is diffusing through an inert air film 2 mm thick at a temperature of 20°C and pressure 1 atm. The concentration of ammonia is 10% by volume on one side and zero on another side of film. Determine the mass flux. Estimate the effect on rate of diffusion if pressure is increased to 10 atm. The diffusivity of ammonia in air at 20°C and 1 atm 0.185 cm^2/s. **[10]**

P.T.O.

Q3) a) Explain two film theory and penetration theory. **[8]**

b) In a transfer operation operating at 1 atm. the individual mass transfer coefficients have the following values, K_x = 22 kgmol/m^2h K_y = 1.07 kg mol/m^2h. The equilibrium composition of gaseous and liquid phases are characterized by Henry's law p* = 0.08 × 10^6 *x* mm Hg. **[8]**

i) Determine the overall mass transfer coefficients.

ii) Determine the resistance of liquid and gas phase.

OR

Q4) a) Define mass transfer coefficient. Derive the relation between overall mass transfer coefficient and individual mass transfer coefficient for each phase. **[8]**

b) Ammonia is absorbed by water in a wetted wall column using operating temperature 20°C and 1 atm. pressure. The overall gas coefficient is 1 kmol/m^3. atm. At one point in the column the gas contains 10 mole% NH_3 and the liquid phase contains 0.155 mole NH_3/m^3 of solution. 96% of total resistance is in the gas phase. Assume Henry's law constant at 293°K = 4.247 × 10^{-3} atm/mol/m^3. Determine individual film coefficients and the molar flux. **[8]**

Q5) a) Derive an equation for height of packed bed absorption column in terms of NTU & HTU. **[8]**

b) A packed column is to be designed to absorb sulphur dioxide from air by scrubbing the gas with water. The entering gas is 20% SO_2 by volume and leaving gas is to contain 0.5% SO_2 by volume the entering water SO_2 free. The water flow is to be twice the minimum. The So_2 free air flow rate is 975 kg/hrm^2. The temperature is 30°C and total pressure is 2 atm.

The equilibrium data is governed by $\frac{y}{1+y} = 21.8\frac{x}{1+x}$ where y and x are mole fraction units. Calculate the number of overall gas - phase transfer units. **[10]**

OR

Q6) a) Give comparison between packed and plate column. **[5]**

b) Explain in brief equilibrium in gas absorption. **[5]**

c) What are various types of packing used in absorption column? Explain construction and working of packed bed absorption column and define the concept of HETP. **[8]**

SECTION - II

Q7) a) Define the following terms. **[8]**

i) Absolute humidity.

ii) Humid heat.

iii) Humid volume.

iv) Saturation humidity.

b) The air in a room is at 26.7°C and a pressure of 101.325 Kpa and contains water vapor with a partial pressure 2.76 kpa. Calculate the following

i) Humidity,

ii) % saturation humidity,

iii) % relative humidity, if PÅ = 3.50 Kpa. **[8]**

OR

Q8) a) Write short note on : **[8]**

i) Wet bulb temperature.

ii) Humidification and dehumidification operation.

b) A mixture of nitrogen - acetone vapor at 800 mmHg and 25°C has percentage saturation of 80%. Calculate **[8]**

i) Absolute humidity,

ii) Partial pressure of acetone,

iii) Absolute molal humidity.

Q9) a) Explain construction and working of following equipments with neat sketch. **[12]**

i) Tray towers.

ii) Mechanically agitated vessels.

b) Write short note on pressure drop in packed column. **[4]**

OR

Q10) Write short note on : **[16]**

a) Materials of packing and their characteristics.

b) Venturi srubber.

c) Flooding and loading.

d) Different type of trays used in plate column.

Q11) a) Explain theories of movement of moisture within the solid. **[4]**

b) Define following terms : **[4]**

i) Equilibrium moisture content,

ii) Free moisture content,

iii) Critical moisture content,

iv) Unbound moisture

c) A slab of paper pulp 1.5 m × 1.5 m × 5 mm is to be dried under constant drying conditions from 65 to 30% moisture (wet basis) and the critical moisture is 1.67 kg free water / kg dry pulp. The drying rate at the critical point has been estimated to be 1.40 kg/m^2. hr. The dry weight of each slab is 2.5 kg. Assuming drying to takes place from two large faces only, Calculate the drying time to be provided. **[10]**

OR

Q12) a) What are various type of dryers? Explain any one in brief. **[6]**

b) A batch of solid for which the following table of data applies is to be dried from 25% to 6% moisture. The initial weight of the wet solid is 300 kg and the drying surface is 1m^2/ 8 kg dry weight Determine the time for drying. **[12]**

X :-	0.35	0.25	0.20	0.18	0.16	0.14	0.12	0.10	0.09
N :-	0.3	0.3	0.3	0.266	0.239	0.208	0.18	0.15	0.097
X :-	0.08	0.064							
N :-	0.07	0.025							

Where $X = \frac{\text{Kg moisture}}{\text{Kg dry solid}}$, $N = \frac{\text{Kg moisture evaporates}}{m^2.hr.}$

♦♦♦♦

Total No. of Questions : 12]

SEAT No. :

P1123

[Total No. of Pages : 4

[4163] - 309

T.E. (Chemical)

MASS TRANSFER - II

(2008 Pattern) (Semester - II)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:-

1) ***Answer Q.1 or 2, 3 or 4, 5 or 6, 7 or 8, 9 or 10, 11 or 12.***
2) ***Answers to the two sections should be written in seperate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule Mollier charts electronic pocket calculator and steamp tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain positive deviation from ideality? **[6]**

b) A feed liquid consisting of 1200 g.moles of a mixture containing 30 mole percent napthalene (1) and 70 mole % dipropulene glucol (2) is differentially distilled at 100 mm Hg until the final distillate contains 55 mole % napthalene (1). The VLE data at 100 mm Hg are **[12]**

X_1	8.4	11.6	28	50.6	68.7	80.6	88
Y_1	22.3	41.1	62.9	74.8	80.2	84.4	88

i) Determine the amount of distillate.

ii) Determine the concentration of napthalene in the residue still liquid.

OR

Q2) a) State and explain principle of low pressure distillation. **[6]**

b) A liquid mixture containing 50 mole % heptane (A) and 50 mole % octane (B) is to be continuously flash vaporised at 1.0 standard atm. Pressure to vaporise 60 mol % of the feed. What will be the composition of the vapour and liquid in the separator for an equilibrium stage? Data. **[12]**

T°,C	98.5	105	110	115	120	125.5
V.P. of A, MM Hg	760	940	1050	1200	1350	1540
V.P. of B, MM Hg	333	417	484	561	650	760

P.T.O.

Q3) a) Explain the use of open steam in distillation column. **[4]**

b) A mixture of 60% n - heptane (C_7H_{16}) and rest n - octane (C_8H_8) is fractionated in a continuous fractionating column to get products of 99 mole % purity.

The column is operated at a pressure 101.325 kN/m^2 with a vapour velocity of 0.62 m/s.

The feed is all liquid at its boiling point and is supplied to the column at the rate 5t/h.

The boiling point of the liquid at the top of the column is 372°K and the equilibrium data are

y	0.960	0.911	0.829	0.739	0.650	0.50	0.369	0.24
x	0.92	0.821	0.690	0.569	0.459	0.321	0.219	0.129

Estimate : **[12]**

i) The minimum reflux ratio.

ii) The column diameter if the reflux used were twice the minimum possible.

OR

Q4) a) What do you mean by reflux ratio? Explain optimum reflux ratio? **[4]**

b) A fractionating column operating at 1.0 atm. Pressure is supplied at the optimum location with a saturated liquid feed containing 40 mole % ethanol and 60 mole % water. The column produces a saturated liquid overhead product containing 80 mole % ethanol and a saturated liquid bottom product containing 20 mole % ethanol the reflux ratio is 2.0 Find. **[12]**

i) The number of theoretical stages required to give the separation.

ii) The optimum feed plate location assuming 100% plate efficiency.

Data :

x -	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
y -	0.196	0.355	0.485	0.600	0.688	0.767	0.837	0.898	0.952	1.0

Q5) A 2500 kg batch of pyridine - water solution 50% pyridine is to be extracted with chlorobenzene three times and each time 2200 kg of solvent is used. Determine the concentration of pyridine in the final raffinate.

Equilibrium tie - line data for the system water - chlorobenzene - pyridine at 25°C are given below. **[16]**

Pyridine	Chlorobenzene	Water	Pyridine	Chlorobenzene	Water
0	99.95	0.05	0	0.08	99.92
11.05	88.28	0.67	5.02	0.16	94.82
18.95	79.90	1.15	11.05	0.24	88.71
24.10	74.28	1.62	18.90	0.38	80.72
28.60	69.15	2.25	25.50	0.58	73.92
31.55	65.58	2.87	36.10	1.85	62.02
35.05	61.00	3.95	44.95	4.18	50.87
40.60	53.00	6.40	53.20	8.90	37.90
49.00	37.8	13.2	49.00	37.80	13.20

OR

Q6) Nicotine (A) in a water (B) solution containing 1% nicotine is to be extracted with kerosene (C) at 20°C water and kerosene are essentially insoluble

a) Determine percentage extraction of nicotine if 100 kg of feed solution is to extracted once with 150 kg solvent.

b) Repeat for three stages using 50 kg solvent each

Data :

X′	$\frac{\text{kg nicotine}}{\text{kg water}}$	0.001011	0.00246	0.00502	0.00751	0.00998	0.0204
Y′	$\frac{\text{kg nicotine}}{\text{kg kerosene}}$	0.000801	0.001961	0.00456	0.00686	0.00913	0.00187

[16]

SECTION - II

Q7) a) 60 t/day of oil sand (25% by mass of oil and 75%) is to be extracted with 40 t/day of naphtha in a continuous counter current extraction battery. The final extract from the battery is to contain 45 mass % oil and 55 mass % naphtha. The under flow from each unit contains 35 mass % solution and 65 mass % sand. If the overall efficiency of the battery is 40%, how many stages will be required. **[8]**

b) Explain constant and variable underflow with diagram. **[8]**

OR

Q8) 500 kg/h of feed containing oil is feel to a counter current cascade to extract oil. The ether which has been partially purified contains 2% oil. The fresh feed contains 20% oil which has to be reduced to 2%. 250 kg/h of solvent is used. What is the percentage recovery of oil and what is the number of stages required. The entrainment data is as follows : **[16]**

Concentration kg oil / kg sol^{n}	0	0.1	0.2	0.3	0.4	0.5
kg solution / kg exhausted solid	0.288	0.368	0.44	0.51	0.6	0.71

Q9) a) Explain the breakthrough curve. **[10]**

b) Equilibrium adsorption of colour on activated carbon is given by $y = 0.5\ x^{0.5}$ where
y = gm of colour removed /gm of adsorbent.
x = gm of colour / 1000 gm of colour free - oil.
100 kg oil contains 30% colour. It is treated with 30 kg of adsorbent. Calculate the percentage of colour removed if all the solid is added in one step. Also calculate the percentage colour removed when the solid is added in two steps of 15 kg each. **[8]**

OR

Q10) a) What are the desirable properties of an adsorbent? **[6]**

b) Explain pressure swing adsorption. **[6]**

c) Derive a correlation between LUB and time required for breakthrough point. **[6]**

Q11) a) Describe the working of Oslo evaporative crystallizer. **[8]**

b) A solution containing 500 kg Na_2CO_3 and water has a concentration of 25% by wt. of salt. It is cooled from 335 K to 285 K in an agitated mild steel vessel wt. of the vessel is 750 kg. 2% water is lost by evaporation. Crystals of Na_2CO_3. 10 H_2O are formed. Calculate the yield of crystals and the heat to be removed.
The data for the process :
Solubility at 285 K : 8.9 kg/100 kg water.
Heat capacity of solution : 3.6 kJ/kg K
Heat capacity of M.S. : 0.5 kJ/kg K
Heat of solution : – 78.5 MJ/K mol
Latent heat of vaporization : 2395 kJ/ kg **[8]**

OR

Q12) a) Explain the process of reverse osmosis. Give applications. **[6]**

b) Give flux equation for a pressure driven process. **[4]**

c) Explain the process of dialysis with applications. **[6]**

♦♦♦♦

Total No. of Questions : 12]

SEAT No. :

P1124

[Total No. of Pages : 3

[4163] - 310

T.E. (Chemical)

PROCESS INSTRUMENTATION & CONTROL

(2008 Pattern) (Sem. - II)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:-

1) ***Answer 03 questions from section I and 03 questions from section II.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
5) ***Assume suitable data if necessary.***

SECTION - I

Q1) a) With the help of block diagram explain the basic components and functional elements of a measurement system. **[6]**

b) How can a personal computer (pc) be used as instrumentation system? **[6]**

c) A first - order measurement system has time constant of 1 second and sensitivity 3. If input of this system is given unit impulse change, find the output response at the interval of 0.5 second up to 5 seconds sketch the response curve. **[6]**

OR

Q2) a) With the help of block diagram explain data acquisition and conversion system. **[6]**

b) Explain use of MP's & MC's in instrumentation. **[6]**

c) A thermometer has a first - order response characteristics with time constant of 2 sec. Initially thermometer is showing room temperature reading of 27°C. The bulb of the thermometer is suddenly immersed in hot liquid maintained at 80°C.

Find :- **[6]**

i) Temperature reading after 1 sec.

ii) Time required for achieving 75% output response.

P.T.O.

Q3) a) Explain construction, working, advantages and limitations of solid - state temperature sensors. **[8]**

b) Explain construction and working of strain measuring instruments. **[8]**

OR

Q4) a) Explain construction and working of liquid - filled pressure thermometers. Explain how ambient temperature compensation is achieved. **[8]**

b) Explain construction and working of variable capacitance type pressure transducer. **[8]**

Q5) a) Explain differential pressure method used for measurement of water level inside the boiler drum. **[6]**

b) Explain construction and working of electromagnetic flowmeter. State its advantages over head flowmeters. **[6]**

c) Explain the difference between a variable - head flowmeter and variable area flow meters (give suitable examples). **[4]**

OR

Q6) a) Explain the ultrasonic method used for measurement of liquid level. **[6]**

b) Explain construction and working of hot wire anemometers used for flow measurement. **[6]**

c) Justify the statement : Coefficient of discharge of venturimeter is higher than that of orifice meter. **[4]**

SECTION - II

Q7) a) State applications of chemical composition measurement. Also classify the methods used for composition analysis based on the atomic/molecular and physical characteristics of matter to be analyzed. **[8]**

b) Explain the basic principle of spectroscopic methods of composition analysis. Explain the working of X-ray absorption spectrometers in detail. **[8]**

OR

Q8) a) Distinguish between absorption and emission spectroscopic methods of composition analysis. Explain the electrical, thermal, and fluorescence methods of emission spectroscopy methods of analysis. **[8]**

b) Explain principle, construction and working of thermal conductivity analyzer used for analyzing gas mixtures. **[8]**

Q9) a) Find the output response of a first order system with T_p = 1 min & K_p = 2 to

i) a step change of magnitude 2 units.

ii) a unit impulse change.

iii) a unit pulse change of duration 5 sec.

iv) a unit ramp change.

In each case, calculate the response at an interval of 0.5 min upto 4 min and sketch the response curve. **[12]**

b) What is process identification? Explain steps involved in process identification. **[6]**

OR

Q10) a) A rectangular cross - section tank 15cm × 15 cm is initially at steady - state with inlet liquid flow rate 250 LPH & liquid level 5 cm. If input flow rate is suddenly increased to 350 LPH, find **[12]**

i) The transfer function of the tank.

ii) New steady - state level of liquid at the flow rate of 350 LPH.

iii) Find the time required for 80% response.

iv) Find the time required to reach level of 50 cm.

b) In the above example, if inlet flow rate is gradually increased to 350 LPH in 10 sec. find actual level reached after 30 sec. from start of change in input flow rate. **[6]**

Q11) a) With the help of block diagram, explain working of feedback control system. **[8]**

b) Explain the control system for temperature inside the jacketed CSTR based on manipulation of flow rate of coolant liquid. (assume that exothermic reaction occurs in the (STR) **[8]**

OR

Q12) a) What are servo and regulator operations? Derive the servo response of a first - order process having transfer function $G_p(s) = \frac{K_p}{\tau_p s + 1}$ using a p - controller having transfer function $G_c(s) = K_c$. Find the closed - loop parameters $Kp' \& Tp'$ and find the offset sketch the open and closed - loop response curves. **[10]**

b) Describe the control loop for controlling level of liquid inside a surge vessel by manipulation of

i) input flow rate

ii) outlet flow rate. **[6]**

♦♦♦♦

Total No. of Questions : 12]

SEAT No. :

P1153

[Total No. of Pages : 2

[4163] - 359

T.E. (Information Technology)

HUMAN COMPUTER INTERACTION AND USABILITY

(2008 Pattern) (Sem. - II)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:-

1) ***Answer question 1 or 2, 3 or 4 and 5 or 6 from section - I and question 7 or 8, 9 or 10, and 11 or 12 from section - II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain a model of the structure of memory. What are the types of long - term memory? Explain with example. **[8]**

b) What is reasoning? Explain the different types of reasoning with examples. **[8]**

OR

Q2) a) Explain the stages in Norman's model of interaction. What is gulf of execution and gulf of evaluation? **[8]**

b) The human eye has number of limitations. Give three examples. For one of the limitations identified, describe how this should be taken into account in the design of a visual interface. **[8]**

Q3) a) Explain the interaction design process in detail with suitable diagram. **[8]**

b) Explain basic activities of interaction design in detail. **[8]**

OR

Q4) a) How menus and pointers are helpful as interaction styles? Explain advantages and disadvantages of these interaction styles. **[8]**

b) What are the different life cycle models in HCI? Explain the star lifecycle model in detail. **[8]**

Q5) a) Explain the eight golden rules of user interface design in detail. Evaluate microsoft word editor using above eight golden rules. **[10]**

b) What are the activities involved in usability engineering life cycle? Explain each activity in brief. **[8]**

P.T.O.

OR

Q6) a) How can HCI Pattern help for an effective interface design? Explain the characteristics of patterns. **[10]**

b) Explain the principles to support usability. **[8]**

SECTION - II

Q7) a) Explain the DECIDE evaluation frame work in detail. **[8]**

b) Write useful ideas and guidelines for good web page design. **[10]**

OR

Q8) a) List the different evaluation approaches. Explain different evaluation paradigms. **[10]**

b) Write a note on Hutch - world case study evaluation framework. **[8]**

Q9) a) Explain GOMS description of task hierarchy for 'copy and paste a line' in microsoft word. Identify goals, sub - goals, methods, operators and selection rules. **[8]**

b) Explain different dialog design notations. **[8]**

OR

Q10) a) Perform a detailed task analysis to design an interface for 'student admission system'. Identify task domain objects and actions. **[8]**

b) Explain status - event analysis in brief. Describe status - event analysis for email delivery from sender to receiver. **[8]**

Q11) a) Explain following applications for computer - mediated communication : **[8]**

i) Email

ii) Video and virtual environment.

b) Explain differences between virtual reality and augmented reality. **[8]**

OR

Q12) Write short notes on : **[16]**

a) Information and data visualization.

b) Framework for groupware

♦♦♦♦

Total No. of Questions : 12]

SEAT No. : ____

P1157

[Total No. of Pages : 7

[4163] - 371
T.E. (Automobile)
MACHINE DESIGN
(2010 Pattern) (Sem. - I)

Time :4 Hours] ***[Max. Marks :100***

Instructions to the candidates:-

1) ***Answer 3 questions from Section I and 3 questions from Section II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicat full marks.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data if necessary.***

SECTION - I

Q1) a) A steel solid shaft transmitting 15 kW at 200 r.p.m. is supported on two bearings 750 mm a part and has two gears keyed to it. The pinion having 30 teeth of 5 mm module is located 100 mm to the left of the right hand bearing and delivers power horizontally to the right the gear having teeth. 100 of 5 mm module is located 150 mm to the right of the left hand bearing and receives power in vertical direction from below. Using an allowable stress of 54 MPa in shear. Determine the diameter of shaft. **[12]**
Assume kb & kt = 1

b) Prove that the compressive stress induced in a square key due to transmitted torque is twice of shear stress. **[4]**

OR

Q2) a) A solid shaft of diameter 'd' is used in power transmission. Due to modification of existing transmission system, it is required to replace the solid shaft by a hollow shaft of the same material and equally strong intorsion, further, the weight of hollow shaft per meter length should be half of the solid shaft. Determine the outer diameter of hollow shaft interms of 'd'. **[10]**

P.T.O.

b) A rigid coupling is used to transmit 20 kW power at 720 rpm. There are four bolts and the pitch circle diameter of the bolts is 125 mm. The bolts are made of steel 45 C8(Syt = 380 N/mm^2) & factor of safety is 3.Determine the diameters of bolts.
Assume that the bolts are fight finer in reamed and ground holes. **[6]**

Q3) a) In a machine tool application, the tool holder is pulled by means of an operating nut mounted on the screw. The tool holder travels at a speed of 5m / min. The screw has single - start square threads of 48 mm nominal diameter and 8 mm pitch. The operating nut exerts a force of 500 N to drive the tool holder.
The mean radius of the friction collar is 40 mm and coefficient of friction at thread & collar surfaces is 0.15.

Calculate : **[10]**

i) Power required to drive the screw.

ii) The efficiency of the mechanism.

b) A wall bracket is attached to a wall by means of four identicals bolts. Two at A and two at B. as shown in fig 3b. Assuming that the bracket is need against the wall and prevented from tipping about point 'C' by all four bolts and using an allowable tensile stress in the bolts as 35 N/mm^2. Determine the size of bolts on the basis of maximum principal stress theory. **[8]**

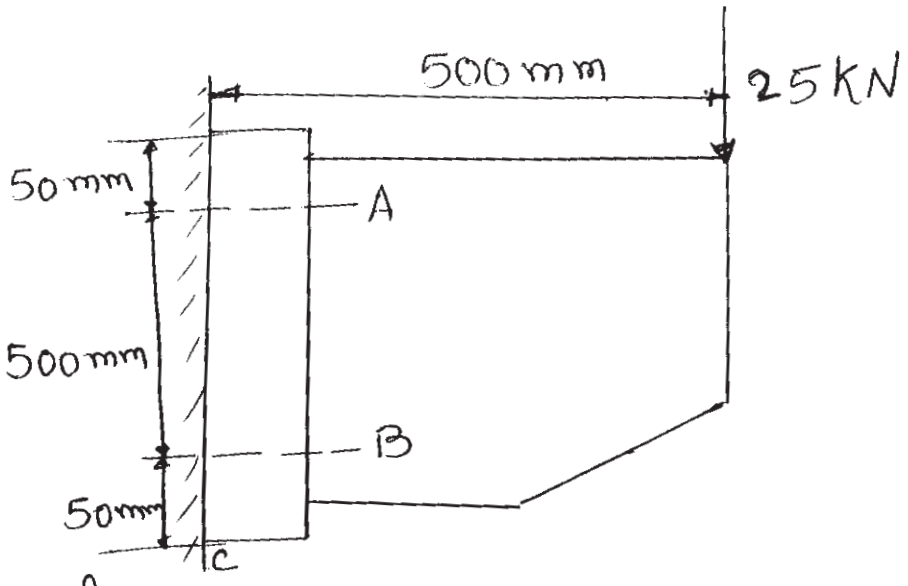

fig 3B. Bolt (Q. NO 3B)

OR

Q4) a) Explain with neat sketch the different methods of converting an ordinary bolt into bolt of uniform strength. **[6]**

b) A welded connection as shown in fig. 4B. is subjected to an ecentric force of 60 kN in the plane of the welds. Determine the size of the welds, if the permissible shear stress for the weld is 100 N/mm^2, Assume static condition. **[12]**

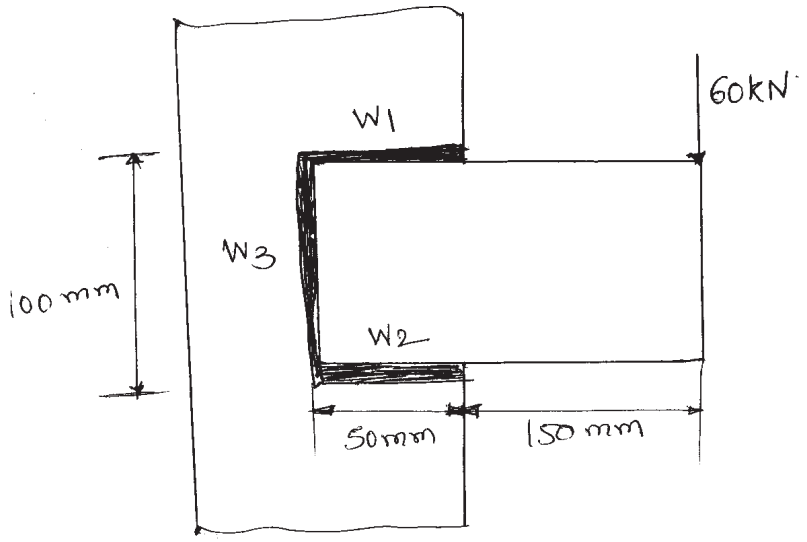

fig 4B. Weld (Q.NO 4B)

Q5) a) What are the causes of stress concentration, and the various methods of reducing stress concentration effect. **[6]**

b) A cantilever beam made of cold drawn steel 40 C8 (sut = 600 N/mm^2) and syt = 380 N/mm^2 is as shown in fig 5 B the force 'p' acting at the free end varies from - 50 N to +150 N. The expected reliability is 90% and the factor of safety is 2. The notch sensitivity factor at the fillet is 0.9. Determine the diameter 'd' of the beam at the fillet cross - section using Gerber curve as failure criterion. **[10]**

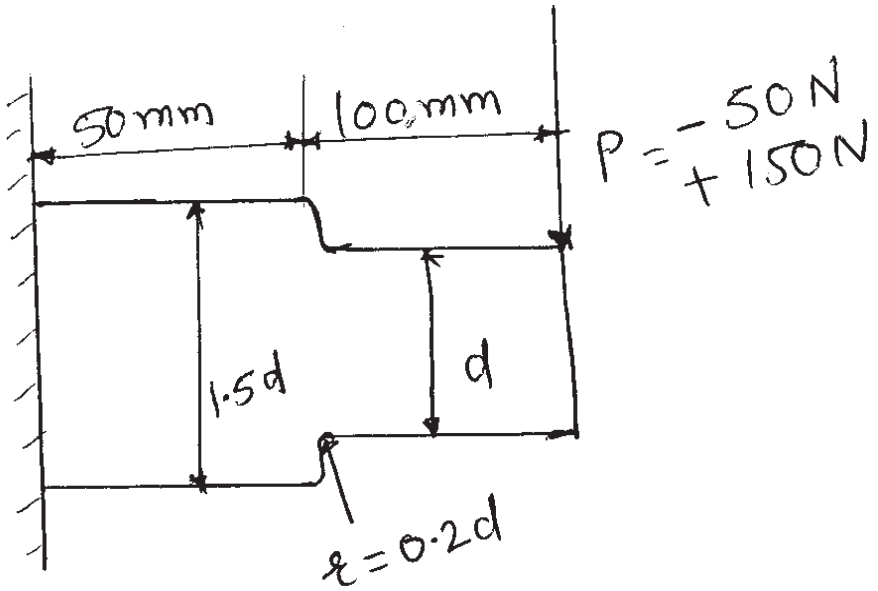

fig 5B. (Q. No 5B)

- Surface finish factor = 0.77
- Size factor = 0.85
- Reliability factor = 0.897
- Stress concentration factor. = 1.44

OR

Q6) a) A polished steel bar is subjected to axial tensile force that varies from zero to p_{max}. It has a groove 2 mm deep & having a radius of 3 mm. The theoretical stress concentration factor & notch sensitivity factor at the groove are 1.8 & 0.95 respectively. The outer dia of bar is 30 mm the ultimate tensile stress of bar is 1250 MPa the endurance limit in reversed bending is 600 MPa. Find the maximum force that the bar can carry for 10^5 cycles with 90% reliability. **[12]**

Take :- Surface finish factor = 1
Size factor = 0.85
Reliability factor = 0.897

b) Explain Gerber and Goodman equations in brief. **[4]**

SECTION - II

Q7) a) Derive formula for resultant stress induced in helical compression spring. **[6]**

b) Design a closed coil helical compression spring with following data,

Service load range = 2250 N to 2750 N.

Axial deflection for this load range = 6mm.

Spring index = 5

Permissible shear stress = 420 N/mm^2

Modulus of rigidity = 84 kN/mm^2

Neglect the effect of stress concentration.

Assume squared and ground ends. Assume total clearance to be 15% of maximum deflection. **[10]**

OR

Q8) a) Explain with sketch, the construction of multi leaf spring. **[6]**

b) A helical tension spring is used in a spring balance to measure weights. One end is attached to a rigid support, while the other end which is free, carries the weights to be measured. Maximum weight attached is 1500 N and length of scale should be approximately 100 mm. Spring index is 6. For spring material, ultimate tensile strength is 1360 N/mm^2 and modulus of rigidity 81370 N/mm^2. The permissible shear stress can be taken as 50% of ultimate tensile strength Design the spring and determine, **[10]**

i) Wire diameter.

ii) Mean coil diameter.

iii) Number of active coils.

iv) Required spring rate.

v) Actual spring rate.

Q9) a) With respect to hydrodynamic bearing. Explain **[6]**

i) Desirable properties of lubricants.

ii) Selection of lubricant.

b) A hydraulic 360° short journal bearing with l/d = 0.4, is to be designed to support radial load of 5 kN. The journal rotates at 5100 r.p.m. The eccentricity ratio is 0.6. If the central lubrication system supplies lubricating oil of viscosity 46.7 c.p. at flow rate of 0.5 lit./min.

Calculate, **[10]**

i) Diameter of journal.

ii) Radial clearance.

iii) Dimensions of bearings.

iv) Minimum oil film thickness.

OR

Q10) a) Explain the procedure to select deep groove ball bearing from manufacturer's catalogue. **[6]**

b) A transmission shaft is supported by two deep groove ball bearings at two ends. The centre distance between the bearings is 160 mm. A load of 300 N acts vertically downwards at a distance of 60 mm from left side bearing and a load of 550 N. acts horizontally at a distance of 50 mm from right side bearing shaft speed is 3000 r.p.m. and expected rating life is 7000 hrs. It is intended to use same sized bearings at both ends. Calculate dynamic load rating of bearing. **[10]**

Q11) a) Write a note :- Gear Tooth Failures. **[6]**

b) A pair of spur gears with 20° full depth involute teeth consists of 21 teeth pinion, connected to a 7.355 kW, 1440 r.p.m., electric motor, meshes with 60 teeth internal gear. The gear shaft supplies power to a machine. The application factor is 1.5. The pinion as well as gear are made of alloy steel with ultimate tensile strength of 1500 N/mm^2. The module and face width are 3mm and 35 mm respectively. The gears are machined to specifications of grade 8, (for which, $e = 16 + 1.25(m + 0.25\sqrt{d})$), and heat treated to 400 BHN. The deformation factor is 11500 e, N/mm. Assuming dynamic load to be accounted by buckinghams equation, determine

i) Factor of safety against bending failure.

ii) Factor of safety against wear failure.

Assume K_m = 1. Use Buckingham's equation for dynamic load,

$$F_d = \frac{21v(bc + F_{t\max})}{21v + \sqrt{bc + F_{t\max}}}$$ **[12]**

OR

Q12) a) Derive formula for virtual number of teeth for helical gear. **[4]**

b) A helical pinion having 14 teeth, to be mode of alloy steel ($\sigma_{ut} = 800 N/mm^2$), is to mesh with a gear to be made of carbon steel ( ). The gear pair is required to transmit 30 kW from an electric motor running at 720 r.p.m to a machine running at 225 r.p.m. The application factor and load factor are 1.3 and 1.1 respectively. The required factor of safety is 2. Face width is 10 times the normal module and tooth system is 20° full depth involute. Helix angle is 25°. The gears are machined to meet specifications of grade 7( ). Deformation factor is 11000 e, N/mm.

Design the gear pair by considering velocity factor, $5.6/(5.6+\sqrt{v})$ and bucking hams equation for dynamic load. **[14]**

$$F_d = \frac{21v[bc\cos^2\psi + F_{t\max}]\cos\psi}{21v + \sqrt{bc\cos^2\psi + F_{t\max}}}$$

♦♦♦♦

$\sigma_{ut} = 720 N/mm^2$ $e = 11 + 0.25\sqrt{d_n}$

Total No. of Questions : 12]

SEAT No. :

P1159

[Total No. of Pages : 2

[4163] - 374

T.E. (Automobile)

AUTOTRONICS

(2010 Pattern)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:-

1) ***Answer any three questions from Section I and three questions from Section II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain working principle of resistive transducer with two examples. **[6]**

b) Define and explain concept of precision and accuracy. **[4]**

c) Explain principle of working of Anti Lock Brake system. **[6]**

OR

Q2) a) Explain working principle of thermoelectric transducer with two examples. **[6]**

b) Define and explain concept of linearity and hysterisis. **[4]**

c) Explain principle of working of Air Bag system. **[6]**

Q3) a) Explain construction, working and application of electromagnetic sensors. **[8]**

b) Explain classification of Manifold Absolute Pressure (MAP) sensors; explain construction & working of any one of them. **[8]**

OR

Q4) a) Explain construction and classification of combustion knock sensor. **[6]**

b) Explain working principle of temperature sensor. **[4]**

c) Explain principle of working and classification of exaust gas sensor. **[6]**

Q5) a) Explain construction, working and applications of programmable logic controllers. **[8]**

b) Explain working of internal relays and timers in PLC. **[6]**

c) Explain working of power windows. **[4]**

P.T.O.

OR

Q6) Write short note on following : **[3 × 6 = 18]**

a) Sequential and combinational locic.

b) Counters in PLC.

c) Analog to digital converter.

SECTION - II

Q7) a) Explain the sequential fuel injection technique with the detail line diagram. **[9]**

b) Discuss the ignition module functions for current limit, dwell and coil life. **[9]**

OR

Q8) a) Discuss in detail electronic ignition system. **[6]**

b) Spark timing control method, devices and trouble shooting. **[6]**

c) Explain injection management and list fuel system components. **[6]**

Q9) a) Draw layout of ABS system and explain working. **[8]**

b) List various vehicle management systems, their components, and subcomponents. Explain any one. **[8]**

OR

Q10) a) Draw layout of electric power steering and explain working. **[8]**

b) Explain sensors used in vehicle management systems for crash and for security system. **[8]**

Q11) a) Explain operation of electronic stability system. **[8]**

b) Explain operation of rollover mitigation system. **[8]**

OR

Q12) a) Discuss latest vehicle safety features in modern car. **[8]**

b) Explain stability, rollover and other essential vehicle running safety features for automobiles. **[8]**

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Total No. of Questions : 12]

SEAT No. :

P1512

[Total No. of Pages : 4

[4163] - 311

T.E. (Petroleum Engg.)

NUMERICAL METHODS AND GEO - STATISTICS

(2008 Pattern) (Sem. - I)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:-

1) ***Answer Q1 or Q2, Q3 or Q4, Q5 or Q6 from section I and Q7 or Q8, Q9 or Q10 , Q11 or Q 12 from section II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Show that the following function is harmonic and find its harmonic conjugate, where $u = \cosh x \cos y$ **[6]**

b) Evaluate $\oint_C \frac{z+2}{z^2+1}\,dz$ where C is $|z - i| = ½$. **[5]**

c) Show that under the transformation $w = \frac{i-z}{i+z}$ x - axis in z - plane is mapped onto the circle |w| = 1. **[6]**

OR

Q2) a) If $f(z)$ is an analytic function of z, and $f(z) = u + iv$, Prove that

$$\left(\frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2}\right)|\operatorname{Re} f(z)|^2 = 2|f'(z)|^2$$ **[5]**

b) Evaluate $\oint_C \frac{e^z dz}{(z+1)^2(z+2)^2}$, where C is the contour $|z + 1| = ½$. **[6]**

c) Find the bilinear transformation which maps the points –1, 0, 2 + i of the z - plane onto points 0, –2i, 4 of the w - plane. **[6]**

P.T.O.

Q3) a) The first four moments about the working mean 30.2 of a distribution are 0.255, 6.222, 30.211 and 400.25. Calculate the moments about the mean. Also evaluate β_1 and β_2 and comment upon the Skewness and Kurtosis of the distribution. **[8]**

b) The table below gives the respective heights x and y of a sample of 10 fathers and their sons. **[9]**

i) Find regression line y on x and x on y.

ii) Estimate son's height if father's height is 65 inches.

iii) Estimate father's height if son's height is 60 inches.

Heights of father x (inches)	65	63	67	64	68	62	70	66	68	67
Heights of son y (inches)	68	66	68	65	69	66	68	65	71	67

OR

Q4) a) The scores obtained by two Batsmen A and B in 10 matches as follows: **[10]**

A	30	44	66	62	60	34	80	46	20	38
B	34	46	70	38	55	38	60	34	45	30

Determine who is more efficient and consistent.

b) Find the standard deviation of Y series, given coefficient of correlation between two variables X and Y is 0.8. Their co - variance is 20 and variance of X is 16. Comment on correlation coefficient. **[7]**

Q5) a) There are three boxes of one dozen eggs each. They contain 2, 3 and 1 spoiled eggs respectively. One box is selected at random and then an egg is taken at random. What is the probability that the egg is spoiled. **[5]**

b) The overall rate of failures in a certain examination is 40 percent. What is the probability that out of a group of 6 candidates at least 4 passed the examination. **[6]**

c) In an poison distribution of X, $P(X = 1) = P(X = 2)$. What is the probability of $X = 1$ or $X = 2$. **[5]**

OR

Q6) a) In a family with 6 children what are the probabilities **[5]**

i) All children will be of the same sex and

ii) Five children are boys given sex ratio is ½.

b) A variable x follows a normal distribution whose mean is 12 and standard deviation is 4. Find $P(x \geq 20)$ [Area corresponding to $z = 2$ is 0.4772]. **[5]**

c) Number of road accidents on a high way during a month follows a poison distribution with mean 5. Find the probability that in a certain month number of accidents on the highway will be **[6]**

i) Less than 3,

ii) More than 3(strictly).

SECTION - II

Q7) a) With usual relations, establish the following results **[9]**

i) $(1+\Delta)(1-\nabla)=1$

ii) $\Delta \log f(x) = \left[1+\frac{\Delta \log f(x)}{\log f(x)}\right]$

iii) $\delta = E^{1/2}\nabla = E^{-1/2}\Delta$

b) Use Trapezoidal rule of numerically evaluate

$I = \int_0^1 xe^{x^2} dx$ by taking $h = 0.1$

Compare the approximate value with exact value. **[8]**

OR

Q8) a) From the table of values of x and y given below, prepare forward difference table. Find the polynomial passing through the points and estimate the value of y when $x = 1.5$. Find the slope of curve at $x = 1.5$ **[9]**

x	0	2	4	6	8
y	5	29	125	341	725

b) Compute the value of the definite integral $\int_{0.2}^{1.4} (\sin x - \log_e x + e^x) dx$ by Simpson's $\frac{3}{8}^{th}$ rule taking $h = 0.1$. **[8]**

Q9) a) Find the real root of the equation $x^3 + 2x - 5 = 0$ by applying Newton - Raphson method at the end of fifth iteration. Write the algorithm for the above method. **[9]**

b) Using method of least squares, fit a parabola of the form $y = ax^2 + bx + c$ to the following data. **[8]**

x	0	1	2	3	4	5	6
y	5	10	19	32	49	70	95

OR

Q10) a) Solve the system of equations by using Gauss - Seidel method **[9]**

$17x + 2y + 3z = 30$

$-x + 12y + 4z = 35$

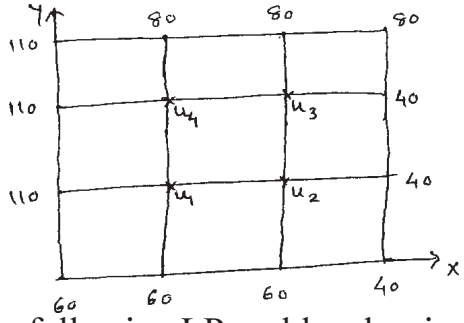
$2x - 3y + 49z = 143$

b) Use Runge - Kutta method of fourth order to solve

$$\frac{dy}{dx} = \frac{1}{x+y}\,[x_0 = 0, y_0 = 1]$$

to find y at $x = 0.4$ taking $h = 0.2$ **[8]**

Q11) a) Solve the Laplace equation $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$ at the pivotal points of the grid shown in the figure [$h = k = 1$] **[8]**



b) Solve the following LP problem by simplex method **[8]**

Maximize $Z = 5x_1 + 3x_2$

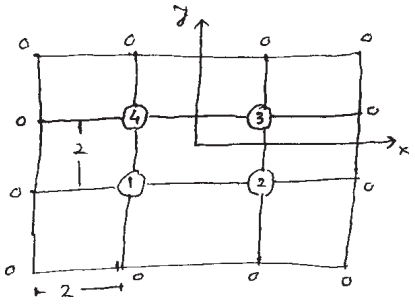
Subject to $x_1 + 2x_2 \le 400$

$x_1 + x_2 \le 600$

$x_1, x_2 \ge 0$

OR

Q12) a) Solve the equation $\frac{\partial^2 f}{\partial x^2} + 2\frac{\partial^2 f}{\partial y^2} = \frac{1}{xy}$ corresponding to the grid shown below $\{h = k = 2\}$ **[8]**



b) Solve the following LP problem by simplex technique

Maximize $Z = 6x_1 + 3x_2 + 2x_3$

Subject to $2x_1 + 2x_2 + 3x_3 \le 300$

$2x_1 + 2x_2 + x_3 \le 120$

$x_1, x_2, x_3 \ge 0$ **[8]**

♦♦♦♦

Total No. of Questions : 12]

SEAT No. : ____

P1514

[Total No. of Pages : 4

[4163] - 336

T.E. (Polymer Engg.)

MATHEMATICAL METHODS FOR POLYMER ENGG.

(2008 Pattern) (Sem. - II)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:-

1) ***Answer Q 1 or Q 2, Q 3 or Q 4, Q 5 or Q 6 from Section - I and Q 7 or Q 8, Q 9 or Q 10, Q 11 or Q 12 from Section - II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Show that $\Delta\nabla = \nabla\Delta = \delta^2$ **[3]**

b) Given

x	0	1	2	3	4	5
y	3	6	11	18	27	38

Find $\frac{dy}{dx}, \frac{d^2y}{dx^2}$ at $x = 0$. **[8]**

c) Evaluate $\int_0^4 \frac{dx}{4x+5}$ taking n = 4 using Simpson's one - third rule. **[6]**

OR

Q2) a) Find $f(6)$ using Lagrange's inter polation formula from the following data: **[6]**

x	3	7	9	10
$f(x)$	168	120	72	63

b) Evaluate $\int_0^{\pi/2} \frac{\sin x}{x} dx$ by simpson's $\frac{1}{3}$ rule dividing the range into 4 equal parts. **[5]**

c) Find the value y from the table at $x = 2.65$ **[6]**

x	–1	0	1	2	3
y	–21	6	15	15	3

P.T.O.

Q3) a) Find a root of the equation $x^3 - 3x - 5 = 0$ by the method of false position. **[6]**

b) Solve the following system of equations by Gauss - Seidel method. **[5]**

$28x + 4y - z = 32$

$x + 3y + 10z = 24$

$2x + 17y + 4z = 35$

c) Fit a parabola to the following data : **[6]**

x :	1	2	3	4
y :	0.30	0.64	1.32	5.4

OR

Q4) a) Use Jacobi iterative method to solve

$5x - 2y + z = 4$

$x + 4y - 2z = 3$

$x + 2y + 4z = 17$ **[6]**

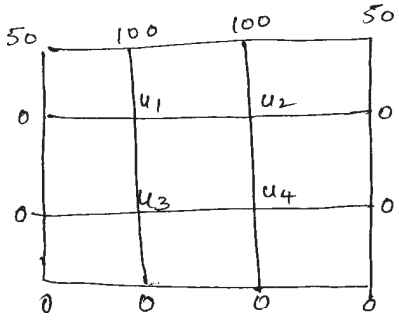
b) Using Newton - Raphson method find a root of $f(x) = e^x - 3x^2 = 0$ **[6]**

c) Fit a straight line of the form $y = ax + b$ for the following data. **[5]**

x	50	70	100	120
y	12	15	21	25

Q5) a) Apply fourth order Runge - Kutta method to $\frac{dy}{dx} = 3x + \frac{y}{2}, \; y(0) = 1$ to determine $y(0.1)$ and $y(0.2)$. **[8]**

b) Solve Laplace equation $u_{xx} + u_{yy} = 0$ for the following square meshes with boundary conditions exhibited in the figure below **[8]**



OR

Q6) a) Solve the following differential equation to get $y(0.1)$ given $\frac{dy}{dx} = x + y + xy \;\; y(0) = 1$ by Modified Euler method with $h = 0.05$. **[8]**

b) Solve the Poisson's equation

$u_{xx} + u_{yy} = -10(x^2 + y^2 + 10)$ over the square with sides $x = 0 = y, \; x = 3 = y$ with $u = 0$ on the boundary and mesh length 1. **[8]**

SECTION - II

Q7) a) Solve the following LP problem by using simplex technique **[10]**

Maximize $Z = 3x_1 + 2x_2 + 5x_3$

Subject to $x_1 + 2x_2 + x_3 \leq 430$

$3x_1 + 2x_3 \leq 460$

$x_1 + 4x_2 \leq 420$

$x_1, x_2, x_3 \geq 0$

b) Write the dual of the following LPP. **[6]**

Maximize $Z = 2x_1 + 3x_2$

Subject to $x_1 - 3x_2 \leq 5$

$2x_1 + x_2 \leq 10$

$x_1 + 4x_2 \leq 20$

$4x_1 + x_2 \leq 12$

where $x_1, x_2 \geq 0$

OR

Q8) a) Use simplex technique to solve the following LPP. **[10]**

Maximize the profit function

$Z = 100x_1 + 120x_2$

The limiting constraints are given by

$2x_1 + 3x_2 \leq 1500,\ 3x_1 + 2x_2 \leq 1500,\ x_1 + x_2 \leq 700$

Where $x_1, x_2 \geq 0$

b) Write the dual of the following LPP **[6]**

Maximize $Z = x_1 + 2x_2 + x_3$

Subject to $2x_1 - x_2 + x_3 \leq 2$

$-2x_1 + x_2 - 4x_3 \geq -5$

$4x_1 + x_2 + x_3 \leq 6$

with $x_1, x_2, x_3 \geq 0$

Q9) a) Mean of 24 items is 15 and standard deviation is 5. One item 12 was wrong. Find the mean and standard deviation if **[6]**

i) item is dropped.

ii) item is replaced by 10

b) The first four moments of a distribution about the value 5 are 2, 20, 40 and 50. Find first four moments about mean, A.m. S.D. coefficients of skewness and kurtosis. **[6]**

c) In a poisson distribution if $p(r = 1) = 2p(r = 2)$, Find $p(r = 3)$ and $p(r = 4)$. **[5]**

OR

Q10) a) The mean and variance of a Binomial distribution are 12 and 4 respectively. Find $p(r \geq 3)$. **[6]**

b) For a normal distribution with mean $\bar{x} = 1$ and S.D. = 3 find the probabilities for the intervals. **[6]**

i) $3.43 \leq x \leq 6.19$,

ii) $-1.43 \leq x \leq 6.19$.

$[z_1 = 1.73, A_1 = 0.4582, z_2 = 0.81, A_2 = 0.2910]$

c) A die when tossed 300 times gave the following results :

Score	1	2	3	4	5	6
Frequency	43	49	56	45	66	41

Is the data consistent at 5% level of significance with the hypothesis that the die is true?

$\left[\tau^2_{S_{i0.05}} = 11.07\right]$ **[5]**

Q11) a) If A_r^{pq} and B_t^s are tensors, show that $A_r^{pq}\ B_t^s$ is also a tensor. What is it's rank and type? **[6]**

b) Determine the conjugate metric tensor in spherical - polar coordinates. **[5]**

c) A covariant tensor has components x^2y, y^2z, z^2x in Cartesian coordinates. Find its covariant components in spherical polar coordinates. **[6]**

OR

Q12) a) A covariant tensor has components $x^2y, 2xy$ in two dimensional rectangular cartesian coordinate system. Find its covariant components in polar system. **[6]**

b) Prove that $[pq,r] = g_{rs}\begin{Bmatrix} s \\ pq \end{Bmatrix}$. **[5]**

c) Define symmetric and skew symmetric tensors. Show that every tensor can be expressed as the sum of two tensors, one of which is symmetric and the other skew - symmetric in a pair of covariant or contravariant indices. **[6]**

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Total No. of Questions : 12]

P1518

SEAT No. :

[Total No. of Pages : 2

[4163] - 370
T.E. (Biotechnology)
BIOINFORMATICS AND MANAGEMENT
(2008 Pattern) (Sem. - II)

Time : 3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer three questions from Section - I and three questions from Section - II.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Draw neat diagrams wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, wherever necessary.***

SECTION - I

Q1) Describe the concept of database and database management system. What is NCBI? What are protein and nucleotide databases? **[18]**

OR

Q2) What is the central dogma of Molecular biology? Enlist the goals and explain the applications of bioinformatics. **[18]**

Q3) Write short notes on : (four marks each) **[16]**

a) Genbank b) EMBL

c) SRS d) Entrez

OR

Q4) Describe in detail the Sangers dideoxy method of sequencing. What is concept of base calling? **[16]**

Q5) Describe protein structural organization hierarchy. Write a note on structural classification database PDB. **[16]**

P.T.O.

OR

Q6) Write short notes on :

a) PFAM database. **[8]**

b) SCOP database. **[8]**

SECTION - II

Q7) Write short notes on :

a) Needleman-Wunsch algorithm. **[9]**

b) Smith Waterman algorithm. **[9]**

OR

Q8) Define local alignment. Write briefly about BLAST and enlist its variants and their use. **[18]**

Q9) Draw a Phylogenetic tree depicting orthologs, paralogs and homologs, write a note on each of them. **[16]**

OR

Q10) Describe concept of phylogeny. What are the steps involved in construction of a phylogenetic tree, describe briefly. Write a note on the distance method of Phylogenetic analysis. **[16]**

Q11) What is industrial management? Which are the different disciplines of management who come together for the smooth functioning of an industry, describe each discipline. **[16]**

OR

Q12) a) Comment on the concept of “Technology Transfer”. **[8]**

b) Write a note on role of a manager in the biotechnology industry. **[8]**

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Total No. of Questions : 6]

SEAT No. :

P1586

[Total No. of Pages : 3

[4163] - 243

T.E. (Production S/W)

MATERIAL FORMING & MOULD DESIGN

(2008 Pattern) (Sem. - II)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:-

1) ***Answers to the two sections should be written in separate books.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
4) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain the concept of formability and forming limit diagram. **[8]**

b) Calculate the ratio of true strain to engineering strain for the values of engineering strains of 0.002, 0.01, 0.015, 0.05, 0.1, 0.22 & 0.5. **[8]**

Also determine values of engineering strains for which true strains and engineering strains are equal.

OR

a) Explain role of friction and lubrication in metal working operations. **[8]**

b) State of stress at a point is σ_x = 120 N/mm^2, σ_4 = 120 N/mm^2, 2_{xy} = 350 M/mm^2 what is yield stress according to Tresca's and Von Mises criteria? **[8]**

Q2) a) What is forgability? Explain any one forgability test in detail with neat sketch. **[8]**

b) Calculate work done in extruding an aluminium billet 780mm diameter & 1.5m long to 5 square bars of 25mm side. Flow stress of aluminium is 60 MPa. Coeff. of friction is 0.25. Also determine power required if the process is completed in 10 minutes. **[8]**

OR

P.T.O

a) Explain principal variables which influence force required for extrusion process. **[8]**

b) Explain how stock size is determined for forging operation. **[8]**

Q3) a) Explain with a neat sketch wire drawing die. **[4]**

b) In a wire drawing operation initial diameter of wire was 7mm. Wire dia. is reduced to 4mm. Die angle is 18° & die land is 4mm. Coeff of friction is 0.15. Find drawing load if, yield stress is 240MPa. **[8]**

c) Explain lubrication in wire drawing. **[6]**

OR

a) Derive an expression for maximum possible reduction in wire drawing operation without friction. **[8]**

b) Explain any two of the following with neat sketch. **[10]**

i) Explosive forming

ii) Magnetic pulse forming

iii) Electrohydraulic forming

SECTION - II

Q4) a) Derive an expression for rolling load in cold rolling process. **[8]**

b) Explain rolling defects with neat sketch. Suggest suitable remedial actions. **[8]**

OR

a) Determine rolling load based on deformed roll radius of CI rolls 600mm diameter while rolling copper strip of 800mm wide and 75mm thick to give 30% reduction given that yield stress of copper is 675 M/mm^2. **[8]**

$E = 1.74 \times 10^6$ M/mm^2

$\mu = 0.35$

b) What is automatic gauge control? Explain any two methods in detail. **[8]**

Q5) a) What is requirement of gating system? Explain different types of gating system. **[8]**

b) Explain defects with remedial actions in casting process. **[8]**

OR

a) Explain design considerations in determining shape & size of riser. **[8]**

b) Explain any two with neat sketch. **[8]**

i) Hot chamber die casting

ii) Cold chamber die casting

iii) Injection moulding machine

Q6) a) Explain how die block dimensions are determined for a single impression die. **[8]**

b) Write short notes on : **[10]**

i) Heat transfer considerations in forging die design.

ii) Allowances for forging die design.

OR

a) What is function of ejector? Explain different types of ejection systems. **[8]**

b) How mould design is dependent upon plastic material parameters? **[5]**

c) Explain with neat sketch injection moulding operation. **[5]**

Total No. of Questions : 6]

SEAT No. :

P1593

[Total No. of Pages : 2

[4163] - 291

T.E. (Printing)

OFFSET MACHINES - I

(2008 Pattern) (Sem. - I)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:-

1) ***Answers to the two sections should be written in separate answer books.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***All questions are compulsory.***

SECTION - I

Q1) a) What is the purpose gear mechanism in offset machine? Explain with diagram the gears used to drive plate and blanket cylinder. **[8]**

b) Explain with neat diagrams of Transfer Drum used for perfecting presses. **[8]**

OR

Explain the following : **[16]**

a) Backlash

b) Pitch circle diameter

c) Eccentric bushing for blanket cylinder

d) Cylinder Packing material and requirements

Q2) a) Explain in brief factors affecting exposing and developing of P.S. plates. **[8]**

b) Differentiate between Thermal CTP & Violet CTP plate processing. **[8]**

OR

a) Explain the role of Silver halide layer in CTP plate. **[8]**

b) Explain advantages and limitations of CTP plate technology. **[8]**

P.T.O

Q3) a) Explain the different methods of setting rollers in sheet fed offset inking unit. **[9]**

b) Explain the purpose of various roller diameters used in offset. **[9]**

OR

a) Explain the ductor and ductorless type inking system with diagram. **[9]**

b) List down various parts of inking system and explain in detail used in offset machines. **[9]**

SECTION - II

Q4) Explain importance of pH, conductivity, surface tension and temperature of F.S. **[18]**

OR

With help of Diagram explain combination continuous flow dampening system. Explain effect of IPA on surface tension graphically. **[18]**

Q5) a) What is an IR dryer? Explain construction. **[8]**

b) Explain working of front lay stops. Explain swing arm gripper. **[8]**

OR

a) Explain various parts in delivery system of offset machine. **[8]**

b) Explain sequence of operation in single sheet feeder. **[8]**

Q6) a) What is the difference between premakeready and makeready. **[8]**

b) Explain waste generated in plate making and measures to reduce them. **[8]**

OR

Explain in brief the importance of quality control aids used for plate production. **[16]**

Total No. of Questions : 6]

SEAT No. :

P1595

[Total No. of Pages : 2

[4163] - 295

T.E. (Printing)

MANAGEMENT INFORMATION SYSTEM AND COST ESTIMATION

(2008 Pattern) (Sem. - I)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***Assume suitable data, if necessary.***
3) ***Answers to the two sections should be written in separate answer books.***
4) ***Neat diagrams must be drawn wherever necessary.***
5) ***Figures to the right indicate full marks.***

SECTION - I

Q1) Explain the functions of management with examples. **[16]**

OR

Explain elements of Competitive Environment with examples.

Q2) Explain the Heidelberg Prinect workflow. **[16]**

OR

Differentiate between the terms Order Qualifier and Order Winner with reference to MIS.

Q3) Explain the application of DBMS in MIS with suitable examples. **[18]**

OR

Explain any one DBMS software in detail.

P.T.O.

SECTION - II

Q4) Draw the flow diagram of Decision making process and explain the same in detail. **[16]**

OR

Explain with suitable examples, how MIS helps the manager in taking correct decisions.

Q5) Explain the Standard costing System in detail. **[16]**

OR

Explain the British Federation of Costing System used in Printing in detail.

Q6) Explain various factors which affect the estimate of a job in detail with suitable examples. **[18]**

OR

Write short note on :

a) Qualification of an estimator.

b) Tools of an estimator.

Total No. of Questions : 6]

SEAT No. :

P1596

[Total No. of Pages : 2

[4163] - 296

T.E. (Printing)

OFFSET MACHINES - II

(Sem. - II) (2008 Pattern)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:-

1) ***All questions are compulsory.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***

SECTION - I

Q1) Explain the following related to roll to web processing. **[16]**

a) Splice Preparation.

b) Roll transport to the paster.

OR

Explain the following :

a) Difference in splicing technology in zero and flying speed.

b) Splice cycle in zero speed.

Q2) a) Explain different Inking units available for web offset. **[8]**

b) Explain non-contacting dampening systems. **[8]**

OR

Explain :

a) Plate cylinder and locking mechanism for web offset machines.

b) Setting the inking rollers.

c) Packing arithmetic.

d) Packing gauge.

P.T.O

Q3) What is the purpose of putting a controlled ripple in the web. How do web offset inks set? **[18]**

OR

a) Explain jaw folding mechanism and its use in commercial printing. Assume necessary sizes. **[10]**

b) Write short notes on : **[8]**

i) Double former folder.

ii) Ribbon folder.

SECTION - II

Q4) Explain the following terms w.r.t. web tension : **[18]**

a) Slip

b) Modulus of elasticity

c) Draw

OR

Explain various tension zones in the web press.

Q5) Explain working of recirculation and refrigeration chilling system used as auxiliary unit for dampening. **[16]**

OR

What is maintenance checklist for pasters and infeed? How is it useful for news paper industry?

Q6) Explain following troubles : **[16]**

a) Trapping, wet and trapping, dry

b) Wavy edged paper, tight edged paper

c) Static on web papers

d) TVI on press

OR

Explain following paper problems :

a) Web wander and web shift

b) Creases and wrinkles

c) Oil and water absorption

d) Brittleness in paper

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Total No. of Questions : 6]

SEAT No. :

P1599

[Total No. of Pages : 2

[4163] - 299

T.E. (Printing)

TECHNOLOGY OF FLEXOGRAPHY

(2008 Pattern) (Sem. -II)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answers to two sections should be written separately.***
2) ***Draw neat diagram wherever necessary.***

SECTION - I

Q1) Explain in detail the advantages of flexo photopolymer plates over rubber plates. Also mention the applications of flexography. **[18]**

OR

Explain in detail considerations for flexo printing job. **[18]**

Q2) a) Calculate % shortening and new negative length for 2.84 mm plate thickness having printed length of 30 cm. **[10]**

b) Mention the effect of fog in the negative on flexo plate reproduction. **[6]**

OR

Explain in detail off-press flexo mounting techniques. **[16]**

Q3) a) Explain in detail the making of a conventional PP plate. **[10]**

b) Mention the relationship between Back-exposure and Wash-out. **[6]**

OR

Explain in detail the checks to be done for maintaining consistency in a conventional PP plate. **[16]**

P.T.O

SECTION - II

Q4) a) Explain in detail the making of a digital flexo photopolymer plate. **[10]**

b) Mention the advantages of digital flexo photopolymer plate. **[6]**

OR

Mention the solvents used in processing of flexo plates and its effect on reproduction of image on to the plate. **[16]**

Q5) Explain Inline and Stack flexo press with applications. **[18]**

OR

Explain in detail the travel of a web in flexo press. **[18]**

Q6) Explain in detail the importance of anilox roller in flexography. **[16]**

OR

Write notes on : (Any four)

a) Cell structures of Anilox in Flexo.

b) Cleaning of Anilox roller.

c) Chemical Etching of Anilox roller.

d) Fountain Roller coverings. **[16]**

Total No. of Questions : 12]

SEAT No. : ____

P1600

[Total No. of Pages : 4

[4163] - 301

T.E. (Chemical)

CHEMICAL ENGINEERING MATHEMATICS

(2008 Pattern) (Sem. - I)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:-

1) ***Answers to the two sections should be written in separate books.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) In a chemical process water vapour is heated to a sufficient high temperature that is sufficient portion of water dissociates to form O_2 and H_2 as $H_2O \rightleftharpoons H_2 + \frac{1}{2} O_2$.

It is assumed that, this is the only reaction involved, the mole fraction of H_2O (x) that dissociates can be represented by

$$K_p = \frac{x}{1-x}\sqrt{\frac{2\,P_t}{2+x}}$$

where K_p = reaction constant = 0.04568

P_t = total pressure = 2 atm

Determine the value of x that satisfy the above equation using Newton Raphson method. **[10]**

b) Determine the real root of the equation $e^x = 5x$ using the method of successive approximation. Assume initial guess $x = 0.15$ and solve upto 5 iterations. **[8]**

OR

P.T.O

Q2) a) Explain convergence and Divergence in case of successive approximation method with graphical interpretation. **[10]**

b) Find the quadratic factor of the polynomial.

$f(x) = x^3 - 2x^2 + x - 2$ using Bairstows method. **[8]**

Q3) a) Solve the following system of equation using relaxation method, upto 4 iterations. **[8]**

b) Explain pivoting in case of Elimination method with suitable example. **[8]**

OR

Q4) a) Using Gauss elimination method with partial pivoting, solve the following equations **[8]**

$5x + 13y + 7z = 14$

$3x + 6y + 3z = 9$

$7x + 2y + 4z = 5$

b) Explain in short backward substitution method and forward substitution method. **[8]**

Q5) a) During a certain process the specific heat capacity of system is given by C = (0.4 + 0.004 T) KJ/kGc. Find heat transferred when temperature changes from 25ºC to 125ºC. The mass of the gas is 3kg. Use trapezoidal rule with number of strips equal to 3. **[8]**

b) Explain the principle of least square method to show the sum of the squares of the residuals is minimum. **[8]**

OR

Q6) a) Explain the quantification of error in linear regression. **[8]**

b) From the following table, find the value of $e^{1.17}$ using Gauss's forward formula. **[8]**

x	1.00	1.05	1.10	1.15	1.20	1.25	1.30
e^x	2.7183	2.8577	3.0042	3.1582	3.3201	3.4903	3.6693

SECTION - II

Q7) a) In certain chemical processes the relation commonly used for the concentration ratio C as $\frac{dc}{dt} = -kc^n$ for time t where K is a reaction rate and n is the order of reaction. If K = 0.08 and n = 1.5. Find the concentration ratio at t = 2. If initial condition C (0) = 11.23 for the accuracy of 0.1 using Modified Eulers method. **[8]**

b) Develop a relation between adjacent cells with appropriate step size for finite difference approximation. **[8]**

OR

Q8) The rate of emission of a radioactive substance is proportional to the amount N of the substance remaining at any instant t, governed by the equation $\frac{dN}{dt} = -kN$, where the negative sign indicates that the radioactivity decreases with time. Taking K = 0.01 and at t = 0, N = 100 gm, find how much material remains when t = 100 sec.

Using Runge-Kutta second order method with h = 50. **[16]**

Q9) A steel plate of 750×750 mm has its two adjacent sides maintained at 100ºC while the two other sides are maintained at 0ºC. What will be the steady state temperature at interior points assuming a grid size of 250 mm. **[16]**

OR

Q10) Solve the following equation **[16]**

$$\frac{\partial^2 4}{\partial x^2} = \frac{\partial^2 4}{\partial t^2}$$

At $t = 0$, $u = \sin 2x$, $0 < x < 0.5$

At $x = 0$ and $x = 0.5$, $u = 1$ for all values of t

Take h = 1 and k = 0.2, find the value of u

at t = 0.05 and $x = 0$ to 0.5

Q11) a) Explain simplex search method in detail. **[12]**

b) Explain analytical method for optimization. **[6]**

OR

Q12) A pressure vessel is to be made from a cylinder of diameter X meters copped with hemisphere at each end. The cost for the cylindrical section is $1800 \times^{0.5}$ Rs./m of length, and the cost for one hemispherical end is $1400 \times^{2.5}$ Rs./-. The vessel is to hold $40m^3$. Find the optimum dimensions and cost. **[18]**

Total No. of Questions : 8] **SEAT No. :**

P1601 **[Total No. of Pages : 3**

[4163] - 313

T.E. (Petroleum Engineering)

DRILLING OPERATIONS

(Sem. - I) (2008 Pattern)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:-

1) ***Question Nos. 1 and 5 are compulsory. Out of the remaining attempt 2 questions from Section I and 2 questions from Section II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What are different components of drill string and discuss functions of each in brief. **[10]**

b) A diesel engine gives an output torque of 1740-ft-lb at an engine speed of 1200 rpm. If fuel consumption rate was 31.5 gal/hr what is the output power and overall efficiency of the engine? Density of diesel = 7.2 ppg heating value is 19,000 Btu/lbm. **[8]**

Q2) a) Discuss in detail reasons, type and BHA for directional wells. **[8]**

b) What is coring? Discuss uses and conventional coring in brief. **[8]**

Q3) a) A triplex single acting pump has liner size 7" inch, 12" inch stroke. If SPM is 60, efficiency is 95% calculate **[4]**

i) Discharge in GPM

ii) Slip

b) Write different causes of kick and different types of ram preventers. Draw 9-5/8" well head BOP stack. **[12]**

P.T.O

Q4) Write short notes on : **[16]**

a) Draw works

b) Differencial stuck up

c) Multilateral wells

d) TCR Bits.

SECTION - II

Q5) a) Explain primary cementation for 13-3/8" casing Job with suitable sketch. **[8]**

b) Discuss different API grades of casing. **[4]**

c) A 600 ft of 13-3/8" surface casing is to be set in 16" hole. The slurry yield is 1.18 cu.ft/sack and 75% excess is needed. The slurry weight is 15 ppg and requires 5.2 gal/sack water. Cement is to be circulated to the surface **[6]**

Given :

Capacity of annulus to be cemented is 0.4 206 cuft/ft

Capacity of 13-3/8" casing is 0.1497 bbl/ft

Calculate

i) Number of sacks

ii) Volume of water

iii) Displacement volume.

Q6) a) Discuss different types & functions of a drilling fluid. **[8]**

b) Calculate B.H.P if density of a drilling fluid is 15 ppg and depth of well is 3000m. **[2]**

c) A mud sample in a rotational viscometer equipped with a standard torsion spring gives a dial reading of 46 when operated at 600 rpm and dial reading of 28 when operated at 300 rpm compute plastic viscosity and yield point. Also discuss these two properties in brief. **[6]**

Q7) a) Calculate the static mud density required to prevent flow from permeable stratum at 12,200 ft, if pore pressure of the formation fluid is 8500 psi. **[2]**

b) Draw circulation diagram and illustrate different pressure losses in the system. **[8]**

c) Ten thousand feet of 19.5 ppf drillpipe and 600 ft of 147 ppf drill collar are suspended off bottom in a 15 ppg mud calculate effective hook load that must be supported by the derrick. **[2]**

d) Discuss drilling fluid behaviour by newtonian model. **[4]**

Q8) Write short note on : **[16]**

a) Bit impact force

b) Classification of cement

c) Use of Hematite and Barite

d) Cement consistometer

Total No. of Questions : 10]

SEAT No. :

P1602

[Total No. of Pages : 4

[4163] - 330

T.E. (Petrochemical)

PROCESS EQUIPMENT DESIGN & DRAWING

(2008 Course) (Backlog)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:-

1) ***Answer three questions from each section.Q. 5 & Q. 10 are compulsory.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) List the different theories of failure. Explain maximum principle stress theory and shear stress theory in brief along with their applications. **[6]**

b) What are the basic qualities required in Process Equipment design engineer for better designs? **[6]**

c) Discuss the steps involved in design of any equipment. **[4]**

OR

Q2) a) Discuss the factors on which magnitude of factor of safety depends. **[4]**

b) Discuss the steps involved in design activity. **[6]**

c) How computer can be used in design activity? Discuss the different stages of design in which computer can be used. **[6]**

P.T.O

Q3) a) What are the advantages and disadvantages of chain drive over belt drive? **[10]**

b) The stress induced at a critical point in a machine component made of steel are as follows: **[6]**

$\sigma x = 100$ N/mm^2 $\sigma y = 40$ N/mm^2

$\tau xy = 30$ N/mm^2

Calculate factory of safety by :

i) Max^m Normal stress theory

ii) Max^m shear stress theory

Assume Syp = 380 N/mm^2 = σpermissible

OR

Q4) The load on a member consists of an axial pull of 20 KN, with shear force of 10 KN. find the diameter of member according to **[16]**

a) Max$^{m\ N}$ Normal stress Theory

b) Max Strain Energy Theory

c) Max Principle strain theory

Q5) a) Discuss the various accessories used in pressure vessel with neat sketch. **[6]**

b) Write a note on overprotection devices used in pressure vessel. (with neat sketch) **[12]**

i) Blow down

ii) Pressure relief valves

iii) rupture disc

iv) steam trap

SECTION - II

Q.6) a) Write Functions of Baffles and Tie rods in Shell and tube heat exchanger. Draw its neat sketch. **[10]**

b) Explain the causes of vibrations in a shell and tube heat exchangers and their effect on the performance of heat exchangers. **[6]**

OR

Q7) a) Discuss with neat sketches different types of head and closure used in Shell and tube heat exchangers. **[6]**

b) For the heat exchanger data find out diameter and thickness of shell: Data: **[10]**

i) Number of tubes = 64

ii) Number of passes = 2

iii) Outside diameter of tube = 20 mm

iv) Pitch (square) = 25 mm

v) Proportionality Factor (β) = 0.8 (Triangular Pitch)

= 0.7 (Square Pitch)

vi) Internal shell pressure (Pi) = 0.55 N/mm^2

vii) Material is Carbon Steel.

viii) Permissible stress of the material = 130 N/mm^2

ix) Welding efficiency = 85 %

Also find the diameter of shell if triangular pitch is selected.

Q8) a) Discuss the important parts of any storage vessel/tank with neat sketches. Why thickness is different in shell? **[6]**

b) Discuss the design of flat bottom cylindrical storage tanks. What are the formulae used to get the shell thickness at different height. Also mention the plate thickness for bottom plates of this cylindrical tank. Also give design of conical roof with considering slope 1 in 5. **[10]**

OR

Q9) a) Discuss various types of floating roofs in Storage Tanks. **[8]**

b) A tall vertical vessel 3m. in outside diameter & 45m in height has shell thickness of 16mm. Corrosion allowance is not necessary. The vessel is insulated with 80mm thick magnesia insulation. The vessel is 138kg/m^2, weight of vessel is 95000 Kg. Calculate bending moments & stresses induced due to those moments. Also calculate the time of vibration in seconds. **[8]**

Data:

i) K1 = 0.7

ii) K2 = 1

Seismic Coefficient (Cs) = 0.08

Q10) Write Short notes on: **[18]**

a) Color codes in pipeline

b) Pipe supports (With sketch)

c) Importance of factor of safety

d) Piping for crude oil, natural gas and Sea water

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Total No. of Questions : 12]

SEAT No. :

P1603

[Total No. of Pages : 3

[4163] - 333

T.E. (Polymer)

POLYMER STRUCTURE PROPERTY RELATIONSHIP

(2008 Pattern) (Sem. - I)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:-

1) ***Answer three questions from section I and three questions from section II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Your answers will be valued as a whole.***
6) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
7) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What is the effect of Intermolecular forces on mechanical, thermal and electrical properties of polymers. **[10]**

b) Why inspite of having amide linkages, polymethane has lower melting point than polyamide. **[4]**

c) Give the role of amorphous and crystalline structure on polymer flexibility with egs. **[4]**

OR

Q2) a) Give the effect of chemical composition on various polymer properties. **[10]**

b) Out of PP and HDPE, which polymer has high melting point and low density and why? **[4]**

c) Give the role of amorphous and crystalline structure on tensile strength of polymers with egs. **[4]**

P.T.O

Q3) a) Why rubbers are flexible? **[2]**

b) Explain H - bonding and its effect on polymer properties with eg. **[5]**

c) What is the role of chemical groups on adhesion. **[5]**

d) Arc crystalline polymers better than amorphous polymers. Comment. **[4]**

OR

Q4) a) Give the effect of polymer structure and the morphology on optical and wheathering properties with few egs. **[6]**

b) Give the different types of bonds carbon atom forms and its effect on polymer properties. **[7]**

c) Why PS is brittle. What modification can be done to make it resistant to impact. **[3]**

Q5) a) Give the list of various additives required by any polymer and the advantages given by that additive. **[10]**

b) Explain role of polymer structure towards electrical properties with eg. **[6]**

OR

Q6) a) Explain what is meant by narrow and broad molecular weight and what effect it has on polymer properties. **[6]**

b) What is meant by dielectric constant and give the background for dielectric properties of polymers and factors affecting these properties. **[10]**

SECTION - II

Q7) a) Explain the significance of supercooled state and its effect on morphology & thus properties. **[6]**

b) What is meant by 1^{st} order and 2^{nd} order transition. Give one eg. for both transitions. **[6]**

c) What is fringed micdle model and how does it help in understanding polymer morphology? **[6]**

OR

Q8) a) How sphenulitic growth takes place and which properties are affected by it. Which instrument is used to study sphenulitic growth. **[6]**

b) What is meant by molecular flexibility. Explain with egs. **[8]**

c) Out of PVC and PVDC, which has low Tg and why. **[4]**

Q9) a) Explain how thermodynamic forces affect crystallisation in polymers. **[6]**

b) Give the morphological changes that takes place during orientation. How is orientation giving resemblence to crystalline structure? Can crystalline polymers be oriented? **[10]**

OR

Q10) a) Explain how kinetic forces affect crystallisation in polymers. **[6]**

b) Give the effect of crystallisation on properties like processing, mechanical, electrical, thermal and chemical. **[10]**

Q11) a) Give the list of all intermolecular forces available. Explain LDF form of intermolecular force in detail with factors in fluencing them. **[12]**

b) What are emulsions and how are they converted from temperory hetrogenity to permenant continuous solid form. **[4]**

OR

Q12) a) Explain intermolecular bonding due to permenant & induced dipoles. **[12]**

b) Write a short note on foams and their properties. **[4]**

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Total No. of Questions : 12]

SEAT No. :

P1604

[Total No. of Pages : 2

[4163] - 337

T.E. (Polymer Engineering)

POLYMER CHEMISTRY - II

(2008 Pattern) (Sem. - II)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) Give the preparation of phenols and formaldehyde. **[9]**

b) Explain compounding ingredients and role of each of them in PF resin. **[8]**

OR

Q2) a) Write a note properties and applications of silicone resin. **[9]**

b) Compare synthesis and give reactions involved in UF and MF resin preparation. **[8]**

Q3) a) Give the various ways by which polyesters can be prepared. Enlist various acids/anhydrides and glycols used in the preparation of polyesters. **[9]**

b) Give the formulation used to prepare polyester laminating resin. Write a note on any one curing agent. **[8]**

OR

Q4) a) Write a full note on vinyl ester resins. **[9]**

b) Give the production of polyester resin. Explain the reactor design and its working. **[8]**

P.T.O

Q5) a) Give the preparation of resin from bisphenol-A **[8]**

b) Explain amine and acid hardening systems for epoxy resin. **[8]**

OR

Q6) a) Write a note on polyurethane rubbers. **[8]**

b) Write a note on PU foams. **[8]**

SECTION - II

Q7) a) Discuss synthesis, properties and applications of polyacetals. **[9]**

b) Give various possible methods of preparing linear polyamides. **[8]**

OR

Q8) a) Write a note on modified polyimides. **[9]**

b) Give the synthesis of polyimides. Give various reactions involved in it. **[8]**

Q9) a) Write a note on synthesis, properties and applications of PPO. **[9]**

b) Write a note on synthesis, properties and applications of PPS. **[8]**

OR

Q10) a) Write a note on synthesis, properties and applications of polysulphones. **[9]**

b) Write a note on synthesis, properties and applications of polyether ketones. **[8]**

Q11) a) Explain the synthesis of conducting polymers. **[8]**

b) Draw the suitable diagram for various phases in LC materials and explain. **[8]**

OR

Q12) a) Enlist various polymers of biomedical importance, their properties and applications in tabular form. **[8]**

b) Write a note on plasma polymerization. **[8]**

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Total No. of Questions : 12]

SEAT No. :

P1605

[Total No. of Pages : 7

[4163] - 334

T.E. (Polymer Engineering)

DESIGN OF EQUIPMENT AND MACHINE ELEMENTS

(2008 Pattern) (Sem. - I)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:-

1) ***Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6 from section I and answer Q.7 or Q. 8, Q.9 or Q.10, Q.11 or Q.12 from section II.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Figures to the right indicate full marks.***
4) ***Use of scientific calculator, graph paper is allowed.***
5) ***Assume suitable design data, if required.***

SECTION - I

Q1) a) Write in short about - (Any Two) **[6]**

i) Copper alloys

ii) Liquid and gas nitriding

iii) Types of sunk keys

b) A bushed pin flexible coupling is to transmit 20 kW at 1500 rpm. Draw a neat sketch with standard proportions. Design following elements of the coupling **[10]**

i) Pin and rubber bush ii) Hub

iii) Key iv) Flange

Given:

1) Key and shaft are made out of same steel material. Whose shear and crushing stress is 40 MPa and 80 MPa respectively.
2) Hub and flange is of cast iron whose allowable shear stress is 15 MPa.
3) Allowable bearing pressure for the rubber bush is 1 N/mm^2.

P.T.O

Q2) a) Explain maximum principle strain theory (Saint venant's theory). **[5]**

b) Obtain an expression for root diameter of the clomping bolts in case of split muff coupling. **[6]**

c) Using maximum principle stress theory, find the root diameter of a bolt subjected to axial pull of 10 kN and transverse shear stress of 10 kN. Take permissible tensile stress at elastic limit as 100 MPa and poisson's ratio as 0.25. **[5]**

Q3) a) An overhang hollow shaft carries a 900 mm pulley whose center is 250 mm from the center of the nearest bearing. Weight of the pulley is 600 N and angle of lap is 180°. The pulley is driven by motor vertically below it. If permissible tension in the belt is 2650 N. and coefficient of friction between belt and pulley surface is 0.3, estimate diameters of the shaft when internal diameter is 0.6 times the external diameter. Neglect centrifugal tension and assume permissible tensile and shear stresses in the shaft as 84 MPa and 68 MPa respectively. **[10]**

b) Two V-belts in parallel transmit power through grooved pulleys of the same size. Calculate power that can be transmitted between the pulleys. **[8]**

Given:

1) Angle of groove = 30°

2) Cross - sectional area of each belt = 1000 mm^2.

3) Coefficient of friction = 0.15

4) Density of the belt material = 1200 kg/m^3.

5) Pulley diameter = 300 mm

6) Speed = 1000 rpm

7) Maximum safe stress in belt material = 8 MPa.

Q4) a) In case of shafts subjected to combined twisting moment and bending moment, obtain expressions for **[6]**

i) Equivalent twisting moment.

ii) Equivalent bending moment.

b) Obtain the expression for length of a open belt drive. **[5]**

c) A hollow shaft is supported at the ends in bearings. The ratio of internal to external diameter is 0.5. Shaft transmits 5 kW at 200 rpm through a straight tooth spur gear exactly at the mid span of bearings. Find shaft of diameters. **[7]**

Given :

1) Pressure angle of gear = 20º.

2) Allowable shear stress for shalt material = 45 MPa.

3) Pitch circle diameter of gear = 150 mm.

4) Distance between the bearings = 400 mm.

Q5) a) The rolling contact ball bearings are to be selected to support a overhang countershaft. The shaft speed is 750 rpm. The bearings are to have 99% reliability corresponding to a life of 20,000 hrs. The bearing is subjected to an equivalent radial load of 2.5 kN. Consider life adjustment factors for operating conditions and material as 0.9 and 0.85 respectively. Find out basic dynamic load rating of the bearing at 90% reliability. **[8]**

b) A bronze spur gear rotating at 650 rpm drives a cast iron spur gear at a transmission ratio of 5 : 1. The allowable static stresses for the pinion and gear material are 85 MPa and 110 MPa respectively. The pinion has 16 standard 20º full depth involute teeth of module 8 mm. The face width of both gears is 100 mm. Find the power that can be transmitted from the standpoint of strength. **[8]**

Q6) a) With neat sketches, explain any two types of radial ball bearings. **[6]**

b) Explain the term 'Reliability of bearings'. **[5]**

c) Write in short about various commonly used materials for sliding contact bearings. **[5]**

SECTION - II

Q7) a) Explain basic hydraulic circuit for carrying out rotary motion. **[4]**

b) A two pump unloading circuit is shown in fig 1. Explain the functioning of the circuit for low pressure and high pressure operation. **[6]**

c) Explain the functioning of pressure compensated restrictor type flow control valve. **[6]**

d) Give symbol for direct acting pressure relief valve. **[2]**

Q8) a) With a neat sketch, explain functioning of balanced vane pump. **[6]**

b) Explain the principle of operation of pressure reducing valve with a neat sketch. **[6]**

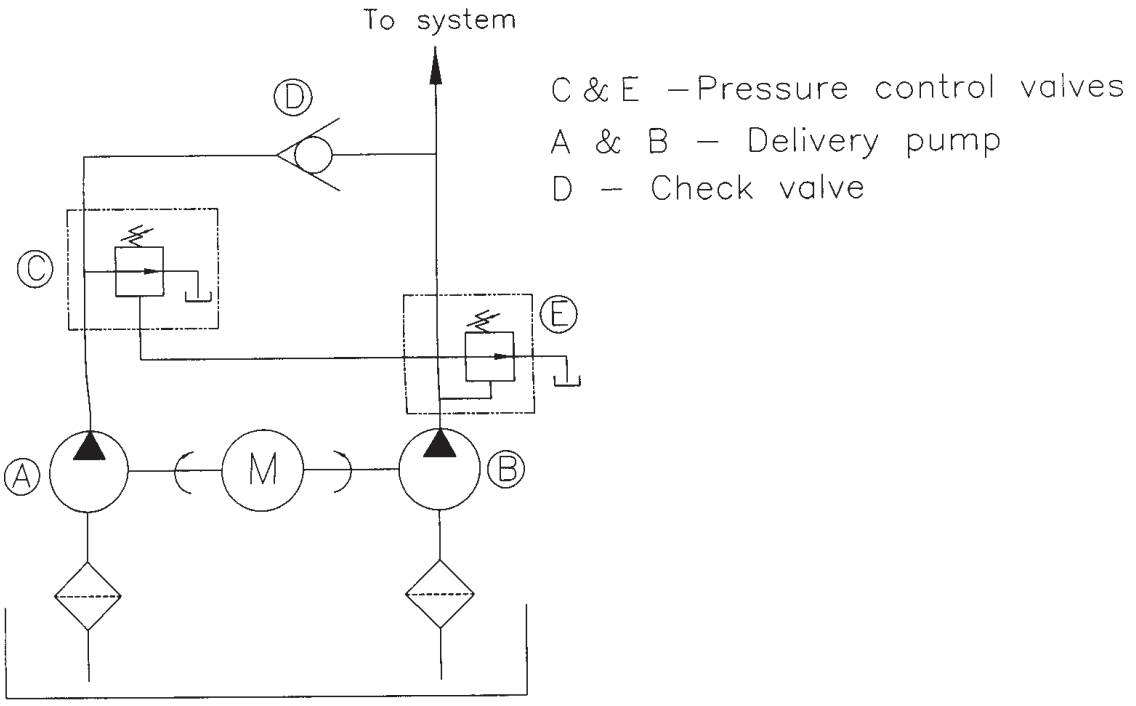


Fig. 1

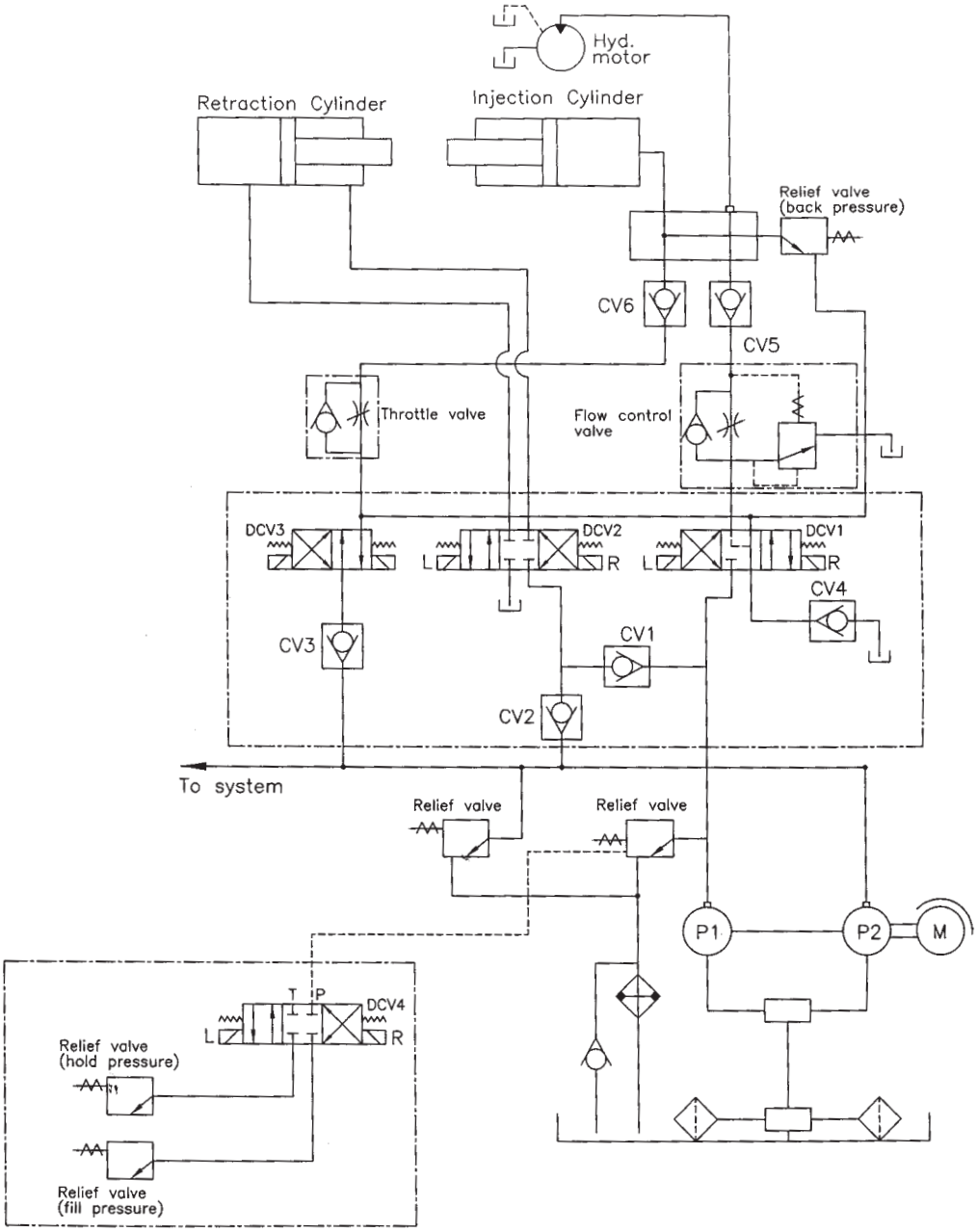
c) With neat sketches, explain the functioning of hydraulic cylinder cushions. **[6]**

Q9) a) In case of toggle type of machines, explain following terms with neat sketches. **[4]**

i) Maximum Daylight.

ii) Mould opening stroke

b) A typical conventional hydraulic circuit is shown in fig. 2 which uses two fixed displacement pumps. Explain how the circuit will function with respect to injection operation. Give valve sequencing. Explain operation with single and double pump. **[12]**



INJECTION CIRCUIT

Fig.2

Q10) a) Explain the merits of 'Lock and Block' type of locking system used in injection moulding machine's. With neat sketch, explain how locking is achieved. **[8]**

b) Write in short about mechanical advantage gained in toggle system. **[4]**

c) Why pressure intensifiers are usually required for tonnage development in direct locking hydraulic machines? **[4]**

Q11) a) Indicate the various stresses induced in a pressure vessel subjected to combined loading. State the method for thickness calculation of such vessel. **[6]**

b) A cylindrical pressure vessel is 2 m in diameter and 4.5 m height. It is subjected to internal pressure of 7.5 kg/cm^2. Assume corrossion allowance of 1.5 mm. The pressure vessel is fabricated as i) Class 'C' with joint efficiency J = 0.5 and ii) Class 'B' with joint efficiency J = 0.8. A strip of suitable size is welded along longitudinal joint (J = 0.1). What will be thickness of vessel when fabricated as class 'B' and class 'C' ? What is percentage saving in material? **[6]**

c) Write a note on torispherical and hemispherical head. **[4]**

Q12) a) Write short note on any two of the following:- **[10]**

i) Nozzle reinforcement procedure

ii) Supports for pressure vessel

iii) Material of construction for pressure vessels.

b) A cylindrical pressure vessel with 1.5 m diameter is operated at 5 kg/cm^2. The permissible stress of the material is 920 kg/cm^2. Welded joint efficiency is 80%. Calculate the thickness of the pressure vessel. If this vessel is to be fabricated in spherical form, what maximum pressure will it be able to with stand? **[6]**

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Total No. of Questions : 12]

SEAT No. :

P1606

[Total No. of Pages : 2

[4163] - 361

T.E. (Biotechnology)

GENETICS ENGINEERING

(2008 Pattern) (Sem. - I)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:-

1) ***Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6 from section I and Q.7 or Q.8, Q.9 or Q.10, Q.11 or Q.12 from section II.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***

SECTION - I

Q1) What is DNA sequencing? Enlist different methods of DNA sequencing and explain Maxam and Gilbert method in detail. **[18]**

OR

Q2) What is RT PCR? Elaborate on this technique with respect to its principle, components involved, methodology and significance. **[18]**

Q3) What is a cloning vector? With a neat labeled diagram explain the components, structure and significance of a typical cloning vector **[16]**

OR

Q4) Answer the following: **[16]**

a) Selection markers are necessary to report successful cloning of a gene in the cell. Justify

b) What are cosmids? How are they useful in genetic engineering

Q5) Write notes on the following: **[16]**

a) Difference between cDNA library and genomic DNA library.

b) Southern blotting.

P.T.O

OR

Q6) Write short notes on: (Any Four) **[16]**

a) YAC's

b) cDNA library

c) Significance of restriction enzymes in genetic engineering

d) Microarray

e) Phagemids

SECTION - II

Q7) Discuss is detail the process of artificial DNA synthesis. Add a note on significance of artificially synthesized DNA in PCR and as probes. **[18]**

OR

Q8) Give an account of process of screening and selection of recombinant clones. **[18]**

Q9) What is gene transfer? Describe in brief the different methods gene transfer. **[16]**

OR

Q10) Explain the following: **[16]**

a) Role of DNA markers for improving quality and yield of crops

b) RAPD

Q11) Discuss the following: **[16]**

a) Applications of transgenic plants

b) What is DNA diagnostics? Explain with suitable example

OR

Q12) Write short notes on: (Any Four) **[16]**

a) Humulin

b) Golden rice

c) Transfection

d) AFLP

e) Significance of transgenic animals

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Total No. of Questions : 12]

SEAT No. : ____

P1607

[Total No. of Pages : 4

[4163] - 366

T.E. (Biotechnology)

REACTION ENGINEERING

(2008 Pattern) (Sem. - II)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:-

1) ***Answer three questions from section I and three questions from section II.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Make necessary assumptions wherever required.***
6) ***Use of programmable calculator is not allowed.***

SECTION - I

Q1) a) Explain the temperature dependency of rate constant by Transition state theory. **[8]**

b) The rate of reaction doubles for a 5ºC increase in temperature occurs only at a specific temperature for a given activation energy (ie. For specific combination of temperature and activation energy). Show that the relationship between activation energy and temperature for which the rule holds is,

$$T = \left[\frac{5kE}{R \ln 2}\right]^{1/2}$$

where, E = 24791.1 Cal/mol **[8]**

OR

Q2) a) Classify and discuss various types of chemical Reactions. **[6]**

b) What is the difference between elementary and non-elementary reaction? Discuss it with suitable examples. **[4]**

c) The activation energy of a chemical reaction is 17982 cal/mol in the absence of a catalyst and 11980 cal/mol with a catalyst. If a reaction proceeds at 45ºC, by how many times the rate of reaction will grow in the presence of a catalyst? **[6]**

P.T.O

Q3) a) What is a Damkohler Number? Discuss significance of Damkohler Number and derive an expression for a second order constant density system if it is carried out in a mixed flow reactor. **[10]**

b) Enzyme 'E' catalyses the fermentation of substrate A to Product R. Reaction is given as: **[6]**

$$A \xrightarrow{\text{Enzyme}} R$$

Estimate the size of a mixed flow reactor needed for 85% conversion of a reactant in a feed stream of 25 l/min of a reactant with initial concentration 2 molA/l and enzyme E. The kinetics of the fermentation is represented at this enzyme concentration by,

$$-r_A = \left[\frac{0.1C_A}{1+0.5C_A}\right] \text{(mol/ l.min)}$$

OR

Q4) a) Find a rate equation for the gas phase decomposition $A \rightarrow R + S$ occurring isothermally in a mixed flow reactor from the following data: **[8]**

Run No.	1	2	3	4	5
τ based on inlet feed conditions in seconds	0.423	5.10	13.5	44	192
X_A	0.22	0.63	0.75	0.88	0.96

X_A values are given for $C_{A0} = 0.002$ mol/lit

b) Derive performance equation of Ideal Batch Reactor with a constant density system. **[8]**

Q5) a) Derive the expression of Residence Time Distribution (RTD) in case of Mixed Flow Reactor. **[10]**

b) Explain in detail effect of state of aggregation in conversion of non-ideal flow reactors. **[8]**

OR

Q6) Calculate the mean residence time and variance for the vessel from the following data: **[18]**

T (min)	0	1	2	3	4	5	6	7	8	9	10	12	14
E $(min)^{-1}$	0	0.02	0.10	0.16	0.20	0.16	0.12	0.08	0.06	0.044	0.03	0.012	0

SECTION - II

Q7) Derive the expression relating time and conversion for shrinking core model for spherical particles of Radius 'R' and unreacted core radius 'r_c' of unchanging size for the following cases: **[16]**

- Diffusion through ash layer controls
- Chemical reaction controls

OR

Q8) a) The reduction of iron ore of size R = 5mm and density $\rho_B = 4.6$ g/cm^3 by hydrogen can be represented by the shrinking core model (SCM) with no water vapour present, the reaction stoichiometry is,

$$4H_2 + Fe_3O_4 \rightarrow 4H_2O + 3Fe$$

The rate is approximately proportional to concentration of hydrogen. The first order rate constant is given by, K" = $1.93 \times 10^5 . e^{-24000/RT}$, cm/s. Taking $D_e = 0.03$ cm^2/s for hydrogen penetration in product layer, calculate the time needed for complete conversion of a particle of oxide to metal at temperature of 60ºC and pressure of 1 atm.

Atomic Wt. Fe = 56, O = 16

Film Resistance can safely be neglected in presence of ash layer. **[10]**

b) Explain two different models based on the behavioral differences of solid catalyst particles when reaction is carried out in fluid phase. **[6]**

Q9) a) Write short notes on: **[10]**

i) Trickle Bed Reactor

ii) Recycle reactor

b) Derive the relation between Thiele Modulus and effectiveness factor and explain its importance in solid catalyzed reactions. **[6]**

OR

Q10) a) How much catalyst is needed in a packed bed reactor with very large recycle rate (Assume mixed flow) for 35% conversion of 2000 mol/h of pure gaseous A at 3.2 atm and 112° C if the stoichiometry and rate are given by:

$A \rightarrow 4R$, $-r'_A = 96.55$ l/ (h.Kg Cat) . C_A **[8]**

b) Write a short note on packed bed catalytic reactor and discuss the significance of Thiele modulus incase of packed bed reactor. **[8]**

Q11) a) Calculate the time needed to convert 80% of urea to ammonia and carbon dioxide in a batch reactor. The initial concentration of urea is 0.10 mol/l and urease concentration is 0.001 g/l. The reaction is carried out isothermally at temperature T. The following data obtained at temperature T with urease concentration of 5g/1 is available: **[10]**

C_{Urea}, mol/l	0.04	0.01	0.0067	0.0033	0.0022
$-r_{Urea}$, mol/l.s	0.5	0.27	0.204	0.119	0.083

The reaction is given as,

$$\text{Urea} + \text{Urease} \rightleftarrows \text{Urea .Urease} \rightarrow 2NH_3 + CO_2 + \text{Urease}$$

b) Derive an expression for Michaelis-Menten Kinetics which is used to represent enzyme catalyzed reactions. **[8]**

OR

Q12) Write Short notes on: **[18]**

a) Substrate limiting microbial fermentation

b) Monod Growth kinetics

c) Competitive and non-competitive inhibition

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Total No. of Questions : 12]

SEAT No. :

P1608

[Total No. of Pages : 3

[4163] - 369

T.E. (Biotechnology)

IMMUNOLOGY AND DIAGNOSTICS

(2008 Pattern) (Sem. - II)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:-

1) ***Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6 from Section - I and Q.7 or Q. 8, Q.9 or Q.10, Q.11 or Q.12 from Section - II.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***

SECTION - I

Q1) List the secondary lymphoid organs and summarize their functions in the immune response. **[18]**

OR

Q2) Describe the nonspecific defenses that operate when a disease-producing microorganism enters the body. **[18]**

Q3) Answer the following: **[16]**

a) How many broad classes of antibody are present in humans? How are the different classes distinguished from one another?

b) What are monoclonal antibodies? Describe the production of monoclonal antibodies in cell cultures.

OR

Q4) Answer the following: **[16]**

a) Graft rejection is an immunologic response - Explain giving the major types of rejection reactions.

b) Briefly outline the mechanisms involved in GVH.

P.T.O

Q5) Write notes: **[16]**

a) Haemagglutination inhibition

b) Immunodiffusion

c) Antigen presentation and processing

d) Role of thymus in T cell maturation.

OR

Q6) Answer the following: **[16]**

a) Draw diagrams illustrating the general structure including the domains, of class I MHC molecules and class II MHC molecules.

b) What is an antigen and antibody interaction? What are the forces that are responsible for antigen-antibody reactions?

SECTION - II

Q7) Explain the different types of hypersensitivity reactions and Indicate the main difference between anaphylaxis and atopy. **[18]**

OR

Q8) Answer the following: **[18]**

a) What are autoimmune diseases and explain its causes?

b) Distinguish between primary and secondary immunodeficiency and write at least one example for each of them.

Q9) Define the role of the following: **[16]**

a) NK cells

b) Effector Cells of the Immune System

c) Cytotoxic T cells.

d) Cytokines.

OR

Q10) Answer the following : **[16]**

a) Complement activation is a cascade of events – explain.

b) How do tumor cells differ from normal cells? What are three likely sources of tumor antigens?

Q11) Write notes : **[16]**

a) HIV infection of target cells and activation of provirus.

b) Active and passive immunization.

OR

Q12) Write short notes : **[16]**

a) The schedule for routine immunization.

b) Attenuated vaccines

c) Adjuvants - potent immunostimulatory agents.

d) The host immune response to tuberculosis.

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Total No. of Questions : 12]

SEAT No. :

P1675

[Total No. of Pages : 4

[4163] - 332

T.E. (Polymer)

POLYMER MATERIALS

(2008 Pattern) (Sem. - I)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:-

1) ***Answer three questions from section I and three questions from section II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Your answers will be valued as a whole.***
6) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
7) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Classify the following polymers into commodity, engineering and high performance polymers. **[6]**

i)	PEEK	ii)	Nylon - 6
iii)	PVC	iv)	PMMA
v)	Polysulphones	vi)	PP

b) Write a short note on EVA; stating its method of preparation, properties and applications. **[6]**

c) Polyvinylacetate is amorphous whereas polyvinylalcohol is crystalline - explain. **[3]**

d) State 2 examples each of polyvinylalcohol and polyvinylacetate. **[3]**

OR

P.T.O

Q2) a) What are the effects of cross-linking polyethylene? State the main approaches used for cross-linking PE. Explain any one of them. **[6]**

b) Explain the compounding of polyethylenol. **[6]**

c) State the properties of Isotactic PP. **[3]**

d) State 3 copolymers containing ethylene. **[3]**

Q3) a) Discuss the following additives w.r.t need for addition, mechanism of functioning and 2 examples of each. **[6]**

i) Lubricants ii) Antiozonants

b) State the polymers used in the following applications giving reasons. **[4]**

i) Hinges ii) Disposable coffee cups

iii) Nirlep pans iv) Rain coats

c) Explain the process for preparation of Expandable polystyrene Foam. Give 2 applications of EPS. **[6]**

OR

Q4) a) Distinguish between plastisols rigisols and organosols. **[6]**

b) Write a short note on processing of polystyrene. **[4]**

c) State 2 outstanding properties of each of the following polymers. **[6]**

i) PTFE

ii) PVC

iii) ABS

Q5) a) Explain the batch process for manufacture of polymethylmethacrylate sheets. **[6]**

b) Explain 2 routes for preparation of polycarbonate. **[4]**

c) Cellulose acetate needs to be compounded with plasticisers. Why? State the plasticisers used with cellulose acetate. **[6]**

OR

Q6) a) State 2 properties of cellulose acetate butyrate [CAB]. How is it manufactured and give 2 applications of CAB. **[6]**

b) Explain the points to be borne in mind while processing polycarbonate. **[4]**

c) State 2 applications of each of the following polymers. **[6]**

i) PTFE

ii) Polycarbonate

iii) PMMA

SECTION - II

Q7) a) State the various ingredients that go into the making of a point state the role of each of the ingredient. **[6]**

b) What is the difference between a lacquer, varnish and a primer? **[6]**

c) What is the role of thickening agents w.r.t adhesives. Give a few examples of the same. **[4]**

OR

Q8) a) State the various types of adhesives. **[4]**

b) What are the points to be considered while choosing a solvent for an adhesive. Give examples of a few solvents. **[6]**

c) Explain the role of dispersing agent and antiskinning agents in the manufacture of paints. **[6]**

Q9) a) Give a brief outline of raw rubber technology. **[6]**

b) What are the molecular requirements for a material to be a rubber? **[6]**

c) What is vulcanisation? State the types of vulcanising agents used with natural rubber. **[6]**

OR

Q10) a) Give a brief outline of latex rubber technology. List the different types of products made by using latex technology. **[6]**

b) Explain the role of tacbifiers in rubbers. In which applications is their addition a must. **[4]**

c) What is the difference between the terms "a vulcanisate" and raw rubber? **[2]**

d) What is mastication? Why is it carried out and how? **[6]**

Q11) a) Differentiate between hot SBR and cold SBR. **[6]**

b) Explain the different steps in the manufacture of ribbed smoke sheets. **[6]**

c) Write a short note on thermoplastic elastomers. **[4]**

OR

Q12) a) Give 2 properties and 2 applications of the following rubbers. **[6]**

i) Butyl rubber

ii) Nitrile rubber

iii) Neoprene

b) Write the structure of the following rubbers. **[4]**

i) Neoprene ii) Nitrile rubber

iii) SBR iv) Butyl rubber

c) Write a short note on compounding of natural rubber. **[6]**

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Total No. of Questions : 6]

P1705

SEAT No. :

[Total No. of Pages : 4

[4163] - 241
T.E. (Production S/W)
MANUFACTURING TECHNOLOGY
(2008 Pattern) (Sem. - I)

Time : 3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answers to the two sections should be written in separate books.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
4) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Estimate the material removal rate in AJM of a brittle material with flow strength of 4 GPa. The abrasive flow rate is 2 gm/min, velocity is 200 m/s and density of the abrasive is 3 gm/cc. **[8]**

b) Glass is being machined at a MRR of 6 mm^3/min by Al_2O_3 abrasive grits having a grit dia of 150 μm. If 100 μm grits were used, what would be the MRR in this USM process. **[8]**

OR

a) Answer following (First attempted question in answer sheet will be evaluated). **[8]**

i) Mechanism of material removal in Electron Beam Machining is due to

1) Mechanical erosion due to impact of high of energy electrons.
2) Chemical etching by the high energy electron.
3) Sputtering due to high energy electrons.
4) Melting and vaporisation due to thermal effect of impingement of high energy electron.

ii) Mechanism of material removal in Laser Beam Machining is due to

1) Mechanical erosion due to impact of high of energy photons.
2) Electro-chemical etching.
3) Melting and vaporisation due to thermal effect of impingement of high energy laser beam.
4) Fatigue failure.

P.T.O.

iii) Generally Electron Beam Gun is operated at
1) Atmospheric pressure.
2) At 1.2 bar pressure above atmosphere.
3) At 10-100 mTorr pressure.
4) At 0.01-0.001 mTorr pressure.

iv) Laser Beam is produced due to
1) Spontaneous emission.
2) Stimulated emission followed by spontaneous emission.
3) Spontaneous emission followed by Spontaneous absorption.
4) Spontaneous absorption leading to "population inversion" and followed by stimulated emission.

b) In electrochemical machining of pure iron a material removal rate of 600 mm^3/min is required. Estimate current requirement. **[8]**

Q2) a) Following table shows the requirements of plastics along with its applications. List type of plastics you will prefer for all design requirements. (Any four out of five) **[12]**

Design requirement	Applications
Mechanical strength	Gears, cams, rollers, valves, fan blades, impellers, pistons
Functional and decorative	Handles, knobs, camera and battery cases, trim moldings, pipe fittings
Housings and hollow shapes	Power tools, pumps, housings, sport helmets, telephone cases
Functional and transparent	Lenses, goggles, safety glazing, signs, food-processing equipment, laboratory hardware
Wear resistance	Gears, wear strips and liners, bearings, bushings, roller-skate wheels

b) Explain following limitations of thermoforming (Any Two) **[4]**
i) Non-uniform wall thickness.
ii) Sheet Cost.
iii) Triming

OR

Explain following molding processes for reinforced plastics (any two) :**[16]**

a) Compression Molding.
b) Vacuum Bag Molding.
c) Contact Molding.
d) Resin Transfer Molding.

Q3) Why is the study of modeling and simulation important for system design, particularly for MEMS design? What are the specifications of requirement as far as modeling is concerned? Give an example of how a parallel plate actuator system can be modeled. Represent the above system in pictorial form and describe each element. **[18]**

OR

a) Find out the desired viscosity to density ratio of a photoresist solution to be prepared for the spin coating by using a vacuum chunk. The allowed time of rotation of the chunk within a production process is 2 minutes and the desired height of photoresist is 50 microns. The rotor rotates at 10,000 rpm. Assume that the original height is 500 microns.**[6]**

b) Discuss the following lithography methods : **[12]**

i) X-ray lithography.

ii) E-beam lithography.

iii) Soft lithography.

SECTION - II

Q4) a) Differentiate between comparing and measuring. Further, Discuss the desirable characteristics of comparator. **[10]**

b) Explain working mechanism of dial indicator. **[6]**

OR

For measurement by light wave interference explain following (any two)**[16]**

a) Fringe patterns and their interference.

b) Michelson interferometer.

c) NPL Flatness interferometer.

Q5) Explain following (any two) : **[16]**

a) Sine Bar.

b) Autocollimator.

c) Angle Dekkor.

OR

Explain principle and applications of measuring instruments of optical and bevel protractor. **[16]**

Q6) Explain Objectives and functions of cost estimating and principle factors in estimating, along with estimating procedure. **[18]**

OR

Write short notes on following (any three) : **[18]**

a) Estimation of volume and weight of material.

b) Provision for scrap and its necessity in estimating.

c) Methods of Depreciation.

d) Replacement Techniques.

e) Time Value for money.

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Total No. of Questions : 12]

SEAT No. :

P1706

[Total No. of Pages : 3

[4163] - 315

T.E. (Petroleum)

PETROLEUM PRODUCTION OPERATIONS

(2008 Pattern) (Sem. - I)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:-

1) ***Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6 from section I and Q.7 or Q. 8, Q.9 or Q.10, Q.11 or Q.12 from section II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Draw the neat schematic sketch of a subsea well head equipment and Indicate various components. Write the functions of every component of it in brief. **[10]**

b) Why chokes are installed in the lower section of tubing strings in some wells? Explain. **[8]**

OR

Q2) a) Discuss in brief procedure to open the well using christmas tree. **[12]**

b) Explain the use of slick line in anyone well intervention job in brief. **[6]**

Q3) a) Draw the schematic sketch of, **[10]**

i) Any one type of subsurface safety valve

ii) Well head Choke

b) List the eight important design considerations for the entire assembly of wellhead equipment and christmas tree. **[6]**

OR

P.T.O

Q4) a) Explain the methodology to overcome the buckling, ballooning tensile failure of a production tubing in brief. **[12]**

b) Write the four important functions of packers. **[4]**

Q5) Describe in detail vertical lift performance and tubing optimization using Gilbert's method. Discuss the graphical procedure in detail. **[16]**

OR

Q6) a) Write various production tubing grades as per API. Which grade should be used for corrosive environment? **[5]**

b) Explain Heading cycle in brief **[6]**

c) Draw the generic graph and explain choke performance in brief **[5]**

SECTION - II

Q7) a) Write the general types of well completion and its objectives. Explain the role of well integrity in well completion. **[9]**

b) Explain the merits and demerits of basic methods of well completion over each other. **[9]**

OR

Q8) a) Draw the schematic sketch of jet perforation and. Indicate all the features. **[6]**

b) Draw the neat schematic sketch and describe in detail any one type of well completion technique useful for horizontal or directional well having sand problem. **[12]**

Q9) a) Construct typical graphs in following cases. **[10]**

i) Vogel and Fetkovich IPR curve

ii) Gas viscosity Vs Reservoir Pressure

iii) Gas formation volume factor Vs reservoir pressure

b) What is Productivity Index and IPR ? Explain their relationship graphically. **[6]**

OR

Q10) a) Write the advantages of horizontal well technology in brief. **[8]**

b) Explain typical pattern of Pressure and GOR variation in case of three different reservoir driving mechanisms. **[8]**

Q11) a) What are the various ways to know and identify well production related problems or workover problems. Write. **[6]**

b) Write the solution to following well problems in brief. **[10]**

i) Scale deposition at the bottom hole of well bore.

ii) Increase in associated gas from oil well.

OR

Q12) a) Write in brief, short notes on any two of the following. **[10]**

i) Gas based artificial lift techniques.

ii) Causes and problems because of formation damage.

iii) Steady and Pseudo-steady state of production from a reservoir.

b) Discuss one application of squeeze cementation in detail. **[6]**

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Total No. of Questions : 8]

SEAT No. :

P1793

[Total No. of Pages : 4

[4163] - 317

T.E. (Petroleum Engineering)

RESERVOIR ENGINEERING - I

(2008 Pattern) (Sem. - II)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:-

1) ***Answers to the two sections must be written in separate answer books.***
2) ***Questions No. 4 (four) and No 6(six) are compulsory.***
3) ***Attempt three questions from each section.***
4) ***Figures to the right indicate full marks.***
5) ***Neat diagrams should be drawn wherever necessary.***
6) ***Use of a non - programmable calculator is allowed.***
7) ***Assume suitable data if necessary.***

SECTION - I

Q1) a) Find the porosity of the most compact arrangement of spherical balls of radius 'r' in a cube. **[4]**

b) Draw the capillary pressure graph versus saturation graph and explain. **[4]**

c) Draw the relative permeability graph and explain. **[4]**

d) Explain the concept of wettability with examples. **[4]**

Q2) Draw phase diagrams of single, two, three and multiphase fluids and explain. **[16]**

Q3) a) What is flash and differential Liberation Process. **[4]**

b) Derive the equation for radial laminar flow of gas in porous media. **[8]**

c) A gas reservoir drains 130 acres and is partially pressured by a water aquifer. The reservoir permeability is 10 md, porosity is 12% and average pressure is 3500 psia. Temperature is 140 F and formation thickness is 127ft. Gas viscosity is 0.012cp, z = 0.9. If the well is flowing at 3150 psia and rw = 0.4 ft, calculate. **[4]**

i) Flow rate,

ii) BHP if rate is increased to 9.5 MMSCF/D

Q4) a) Give one example of a slightly compressible fluid and an incompressible fluid and draw an appropriate graph to distinguish the two. **[2]**

b) Derive an expression for flow rate of a slightly compressible fluid flowing inside a porous media. **[10]**

P.T.O.

c) A fluid of viscosity 2.5 cp and compressibility 65 × 10-6/psi, flows through a porous media of 450 ft length and cross sectional area of 45 sq ft of permeability 250 md. Find the flow rate through the system in bbl/day. **[6]**

i) If the fluid is incompressible.

ii) If the fluid is slightly compressible.

SECTION - II

Q5) Explain, compare and contrast drive mechanisms and drive indices for different reservoirs by showing various graphs. Do drive indices change for a reservoir? Explain. **[16]**

Q6) a) Derive material balance equation for undersaturated oil reservoir. **[6]**

b) Calculate oil in place if

i) compressibilities are included.

ii) compressibilities are not included

Initial reservoir pressure 5000 psia

Initial Two phase FVF = 1.354 bbl/STB

Two phase FVF at 3600 = 1.375 bbl/STB

Connate water saturation = 0.2

cw = 3.6 × 10-6/psi

Bw at 3600 = 1.04 bbl/stb

cf = 5 × 10-6/psi

Np = 1.25 mm STB

Current reservoir pressure = 3600 psia

Wp = 32000 stb

We = 0 **[12]**

Q7) Given an undersaturated reservoir with properties shown in Figure 1, find Initial Oil in Place. At 2500 psia, find the recovery factor. If different volumes of gas are returned to the reservoir at 2500 psia, find the recovery factors. Plot a graph of RF versus gas injected. Cumulative GOR at 2500 psia = 3300 SCF/STB. Cumulative produced oil = 25 mmstb. Reservoir Temperature = 190 F. The initial reservoir pressure is 4400 psia. Use data from Figure 1.What is the maximum recovery factor you can extrapolate to? What is the ideal recovery factor? **[16]**

Q8) The initial volume of gas in place in a certain reservoir is calculated from electric log and core data to be 200 MMM SCF (14.7 and 60 F) underlying 2250 productive acres, at an initial pressure of 3500 psia and 140 F. The pressure production history is **[16]**

Pressure	Production MMMSCF	Gas deviation factor at 140F
3500(initial)	0.0	0.85
2500	75.0	0.82

a) What is the initial volume of gas in place as calculated from the pressure production history assuming no water influx.

b) Assuming uniform sand thickness, porosity, and connate water, if the volume of gas in place from pressure - production data is believed to be correct, how many acres of extension is the reservoir.

c) If, the gas in place is calculated from log and core data is correct, how much water influx must have occurred during the 75 MMMSCF of production to make the two figures agree.

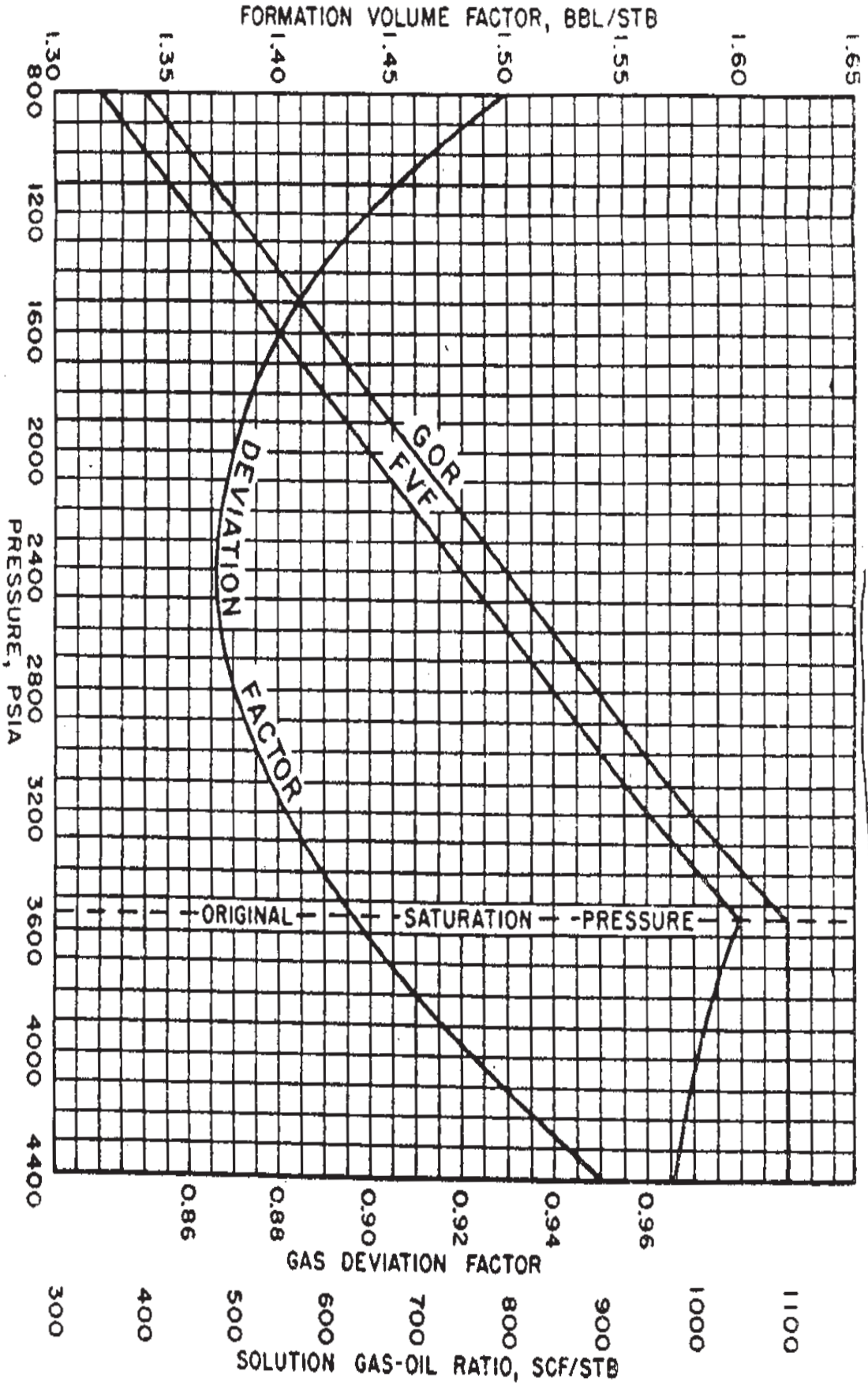
FORMATION VOLUME FACTOR, BBL/STB
1.30
1.35
1.40
1.45
1.50
1.55
1.60
1.65
PRESSURE, PSIA
800
1200
1600
2000
2400
2800
3200
3600
4000
4400
GOR
FVF
DEVIATION FACTOR
ORIGINAL
SATURATION PRESSURE
0.86
0.88
0.90
0.92
0.94
0.96
GAS DEVIATION FACTOR
300
400
500
600
700
800
900
1000
1100
SOLUTION GAS-OIL RATIO, SCF/STB

FIGURE -1

♦♦♦♦

Total No. of Questions : 12]

SEAT No. : ____

P1794

[Total No. of Pages : 4

[4163] - 318

T.E. (Petroleum)

PETROLEUM PRODUCTION ENGINEERING - I

(2008 Pattern) (Sem. - II)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer Q.No. 1 or Q.No. 2, Q. No. 3 or Q.No. 4, Q.No. 5 or Q.No. 6, from Section - I and Q.No. 7 or Q.No. 8, Q.No. 9 or Q. No. 10, Q.No. 11 or Q.No. 12 from Section - II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, Slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Which method or methods of artificial lifting you will propose for the following field information and why? **[12]**

i) Offshore oil production from deviated, high GOR wells with sand production problems.
ii) Onshore, deviated, high PI, high production rate wells.
iii) Onshore heavy oil production from unconsolidated formation along with free gas.
iv) Water loaded gas wells.
v) Deviated wells with low dogleg severity to lift around 300 bbls/day from 11,000 ft depth, medium viscous oil with very low GOR.

b) Draw the neat schematic sketch of any one type of gas lift valve. Show all the components of it. **[6]**

OR

Q2) a) Draw the neat schematic sketch and explain the unloading operation to be used in wells with high P.I. and a reasonably high bottom hole pressure relative to well depth. **[9]**

b) List the types of gas lift valves and show that the casing pressure at depth must be reduced to the dome pressure at depth for the valve to close in case of a casing pressure operated valve. **[9]**

P.T.O.

Q3) a) For a continuous flow injection, use the following data and graphically decide depth for point of gas injection.
Depth = 9000 ft. Expected rate = 1070 bbls/day. (100% oil) Tubing size = $2\frac{3}{8}$ inch. Flowing well head pressure = 150 psig, SBHP = 2900 psig. P.I. = 3.0, Formation GLR = 300, SCF/STB, Sp. Gravity of injection gas = 0.7, S/C operating pressure = 1000 psig, °API = 41, S/C Temp. = 122 °F B.H.Temp. = 222 °F. 300 psi/1000 ft = flowing gradient of FBHP. 22 psi/1000 ft = casing pressure gradient. Subtract 100 psi from point of balance. Also calculate the daily gas injection rate necessary if, optimum GLR = 650 SCF/STB. **[10]**

b) State true or false with relevant mathematical explanation, graphical relationship between surface pressure and pressure at depth.
'In gas lift installation, all valve locations must be known so that dome pressure settings can be made in the shop that will give desired down hole performance'. **[6]**

OR

Q4) Assume suitable data, prepare a pressure depth scale on a graph paper. Describe design procedure for a typical Intermittent gas lift well using multi - point injection.
Use pressure operated valves and time cycle control or choke control at the surface. Indicate important features such as lines of various pressure gradient, depth of every valve, surface pressure etc; on the graph paper. Write the steps along with concern formulas for this design in brief. **[16]**

Q5) a) Write, how the following well parameters can affect working and operational efficiency of ESP pump. **[6]**

i) Pump setting depth, intake pressure and bubble point Pressure.

ii) Viscosity of oil, presence of water.

b) Calculate TDH and total HP, if pump with 0.4 HP/stage is available and each stage gives a head of 28 feet.
Given data : Sp. Gravity of fluid = 1.07 (No gas)
Desired production rate of 1200 bbls/day.
Well Depth = 5850 ft.

The static liquid level = 2200 ft. Casing = 5½ inch O.D. Tubing = inch O.D. T = 164 °F. During the test on this water well it was seen that, it is producing 800 bbls/day with liquid level at 3100 ft in the csg., which then stabilized to above 2300 ft. Use 100 ft safety in setting pump, Tubing friction is given as 30 ft/1000ft. At the surface there is 2100 ft of 2.0 inch flow line with an increase in elevation = 40 ft., with friction = 30 ft/ 1000ft. **[10]**

OR

Q6) Explain the purpose / function of following components in case of ESP. **[16]**

a) Transformer bank.

b) Bleeder valve.

c) Impeller and diffuser of a pump.

d) Blocking fluid and motor oil of protector.

e) Gas separators.

SECTION - II

Q7) a) Refer the Table 04 given below and suggest the largest possible pump size to be installed if, pump is to be set in a well at the working fluid level of 4000 ft., and 200 bbl/day of fluid rate is desired at the surface. If the pumping speed is 20 spm and the effective plunger stroke is 55 inch., calculate the volumetric efficiency of the pump. Comment on pump size and plunger size. **[10]**

Table O4 Recommended pump plunger size [2].

Net lift of fluid (d=1)		Fluid production in bbl/D - 80% efficiency										Head rating	
(ft)	(m)	100	200	300	400	500	600	700	800	900	1000	(psi)	(MPa)
2 000	600	1 1/2 1 1/4	1 3/4 1 1/2	2 1 3/4	2 1/4 2	2 1/2 2 1/4	2 3/4 2 1/2	2 3/4	2 3/4	2 3/4	2 3/4	840	6
3 000	900	1 1/2 1 1/4	1 3/4 1 1/2	2 1 3/4	2 1/4 2	2 1/2 2 1/4	2 3/4 2 1/4	2 3/4 2 1/2	2 3/4	2 3/4	2 3/4	1 260	9
4 000	1 200	1 1/4	1 3/4 1 1/2	2 1 3/4	2 1/4 2	2 1/4 2	2 1/4	2 1/4	2 1/4			1 680	12
5 000	1 500	1 1/4	1 3/4 1 1/2	2 1 3/4	2 1 3/4	2	2 1/4	2 1/4				2 100	15
6 000	1 800	1 1/4	1 1/2 1 1/4	1 3/4 1 1/2	1 3/4							2 520	18
7 000	2 100	1 1/4 1 1/8	1 1/2 1 1/4									2 940	21
8 000	2 400	1 1/4 1 1/8										3 360	24
		16	32	48	64	80	96	112	128	144	160		
		Fluid production in m^3/d - 80% efficiency											

b) What is cyclic load factor? Explain the relationship of the RMS current to the average current for various torque loading conditions in beam pumping applications. **[8]**

OR

Q8) a) What is dynagraph? Draw typical dynagraph sketch to show the problem of fluid leakage from a valve, gas pound and excessive friction conditions in a SRP installed well. **[8]**

b) What is the purpose of following in SRP? Explain. **[10]**

i) Stuffing box.

ii) Tapered sucker rod.

iii) Polished rod.

iv) Gas anchor.

v) Sub surface pump.

Q9) Draw the graphs to demonstrate the following : **[16]**

a) Reservoir inflow Vs tubing outflow for increasing tubing diameters. Show three tubing sizes. : Natural Flow conditions.

b) No flow conditions. Need of ALT in above case.

c) Effect of no. of perforations on production rate

d) Production rate Vs tubing diameter to demonstrate liquid loading conditions.

e) Choke performance curves.

OR

Q10) Given data :

Q_{sc} Mscfd	Pwfs. Psia	P psi (d = 2.441)
25,000	5680	470
20,000	5500	1380
15,000	5400	2100
10,000	5300	3000
5,000	5200	3600

Ts = 100 °F, γ_g = 0.83 C= 0.0006 inch., H = 11,900 ft, T_R = 258°F μg = 0.011 Cp, r_e = 1138 ft, r_w = 0.50 ft., S = 0, h = 25 ft., Perforation diameter = 0.65 inch., z = 0.94, Gravel permeability = 38 darcys., Screen O.D. = 3.06 inch., Hole diameter = 12.25 inch., 4, 8 and 12 perforations per foot are to be evaluated.

Use the above data of bottom hole flowing pressure Vs gas flow rate and pressure drop for 2.441 inch tubing. Decide the feasible perforation sizing, flow capacity for possible pressure loss across the sandface. **[16]**

Q11) a) Discuss in brief the candidate well selection criteria's for well stimulation job. **[8]**

b) Write the reaction of 15% HCL solution with Calcite. Calculate the volumetric dissolving power of acid solution and describe the necessary steps if specific gravity of acid is 1.06 and Calcite density is 167 lbm/ft^3. **[8]**

OR

Q12) a) State and explain the various equations and the meaning of necessary parameters along with their units, that you use to calculate surface injection pressure for a fracturing job. **[6]**

b) Explain in brief the role of following elements in successful completion of a fracturing job. **[10]**

i) Viscosity of a fracturing fluid.

ii) Fluid - loss / leak - off coefficient.

iii) Fracture conductivity and fracture geometry.

♦♦♦♦

Total No. of Questions : 12]

P1045

SEAT No. : ____

[Total No. of Pages : 7

[4163] - 201
T.E. (Civil)
STRUCTURAL ANALYSIS - II
(2008 Pattern) (Sem. - I)

Time : 3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6 from Section - I & Q.7 or Q.8, Q.9 or Q.10, Q.11 or Q.12 from Section - II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) The continious beam loaded & supported as shown in figure 1. The support B sink by 10mm. Analyse the beam & plot BMD. Take

$I = 1600 \times 10^4$ mm^4, $E = 2 \times 10^5$ N/mm^2. Use Slope Deflection method. **[16]**

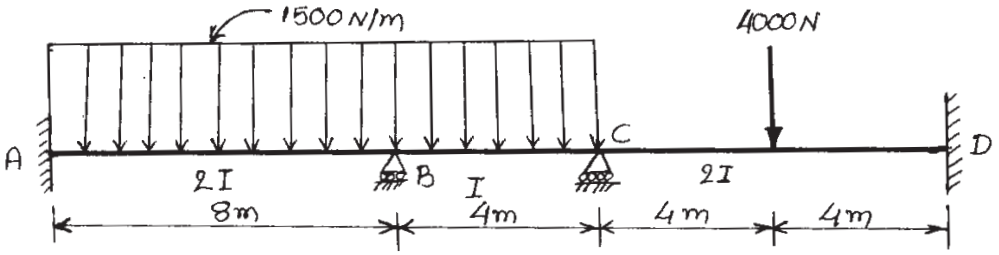

FIGURE -1

OR

Q2) Analyse the frame as shown in figure - 2 and draw BMD. Use Slope-Deflection method. **[16]**

P.T.O.

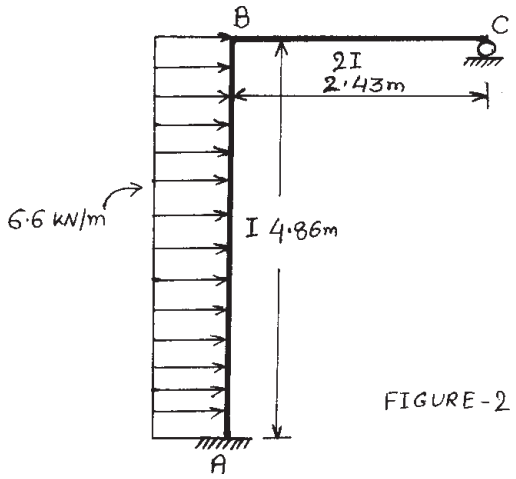

FIGURE-2

Q3) The frame is loaded & supported as shown in figure -3. Analyse the frame & plot shear force & bending moment diagram. Use moment distribution method. **[16]**

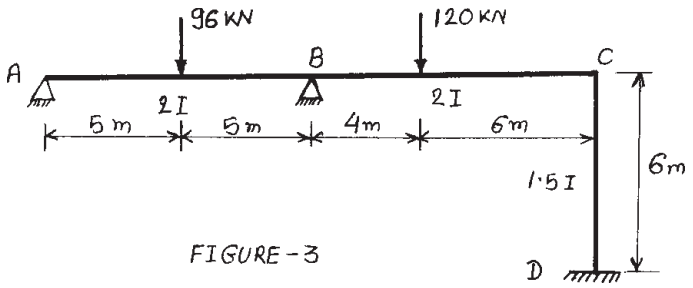

FIGURE-3

OR

Q4) Analyse the frame Shone in figure - 4 by moment Distribution method. Plot SF & BM diagrams. **[16]**

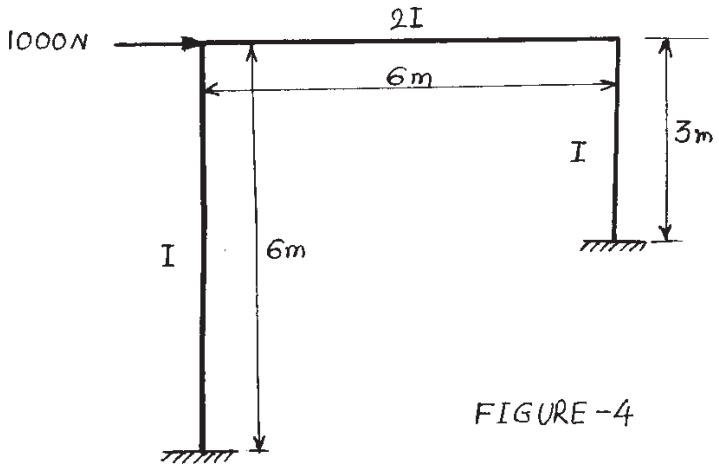

FIGURE-4

Q5) a) A uniformly distributed load of 4000 N/m covers left hand half of span of three hinge parabolic arch of span 36m & central rise of 8m. Determine the horizontal thrust. Also find S.F. & B.M. at loaded quarter span. Take two hinge support at bottom & third hinge at crown. **[10]**

b) A two hinge parabolic arch of span 'L' & rise 'h' carries udl of 'w' per metre run over the whole span. Assuming $I = I_O \sec\alpha$, find expression for horizontal thrust developed. **[8]**

OR

Q6) a) A symmetrical three hinge circular arch has span of 16m & rise to central hinge is 4m. It carries a vertical load of 16 kN at 4m from left hand end. Find **[10]**

i) Magnitude of thrust at springings.

ii) Reactions at supports.

iii) BM at 6m from left hand hinge &

iv) Maximum BM.

b) Show that the horizontal thrust developed in parabolic arch of span 'L' & rise 'h' subjected concentrated load 'W' at distance 'a' from springing is given by $H = \frac{5}{8}\frac{W}{hL^3}\, a(L - a)\,(L^2 + La - a^2)$. **[8]**

SECTION - II

Q7) Analysis the truss supported and loaded as shown in fig. Q7. The cross sectional areas of vertical members are 3000 mm^2 each and those of all other members are 2200 mm^2. Take $E = 2 \times 10^5$ N/mm^2. **[16]**

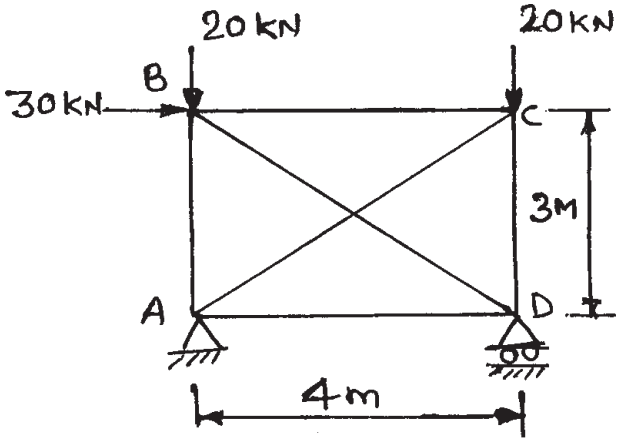

fig. Q.7.

OR

Q8) Analysis the rigid jointed plane frame supported and loaded as shown in fig. Q.8 by flexibility method. Draw B.M.D and elastic curve. **[16]**

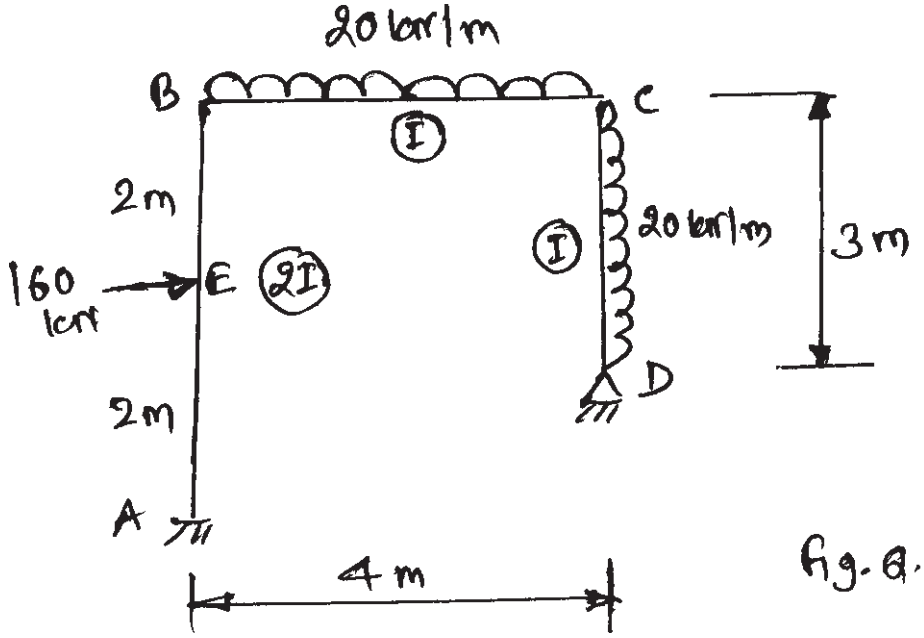

Fig. Q. 8.

Q9) Analysis the beam as shown in fig. Q9 by stiffness method. Draw B.M.D and elastic curve. Take EI = constant. **[16]**

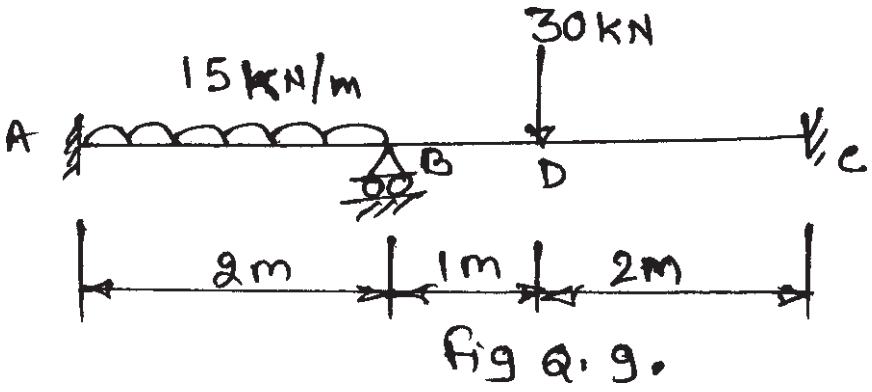

Fig Q. 9.

OR

Q10) Analysis the rigid jointed plane frame supported and loaded as shown in fig. Q.10 by stiffness method. Draw B.M.D and elastic curve. **[16]**

Take EI = constant

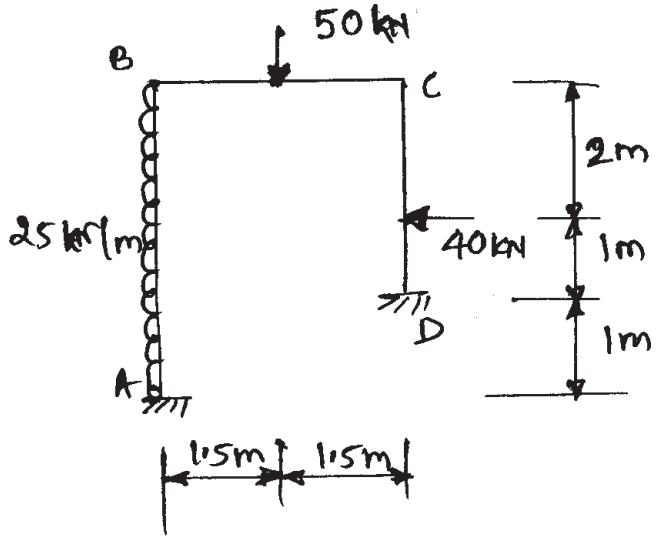

Fig Q.10

Q11) a) The beam is supported and loaded as shown in fig. Q.11(a). Determine the deflection at centre in terms of its EI. Use finite difference method. Use five nodes. **[6]**

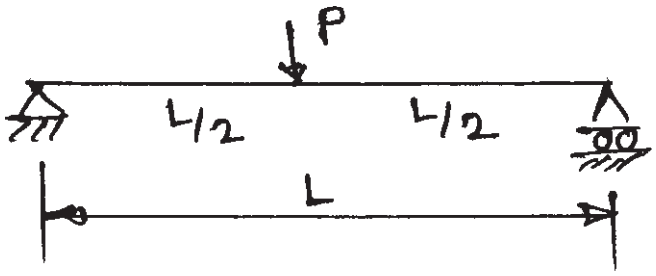

Fig. Q.11 (a)

b) Determine the approximate values of moments, shear and axial force in each member of frame loaded and supported as shown in fig. 11 (b). Draw B.M.D. Use portal Method. **[12]**

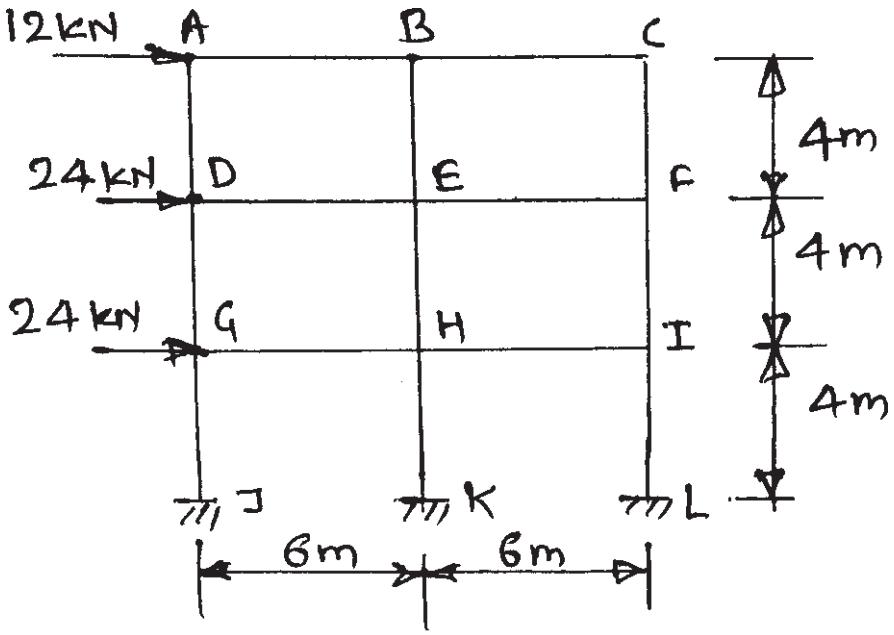

Fig. Q. 11 (b)

OR

Q12)a) The beam is loaded and supported as shown in fig. Q.12 (a). Determine the deflection under the loads. Take EI = 2.4×10^5 kNm^2. Use finite difference method and use five nodes. **[6]**

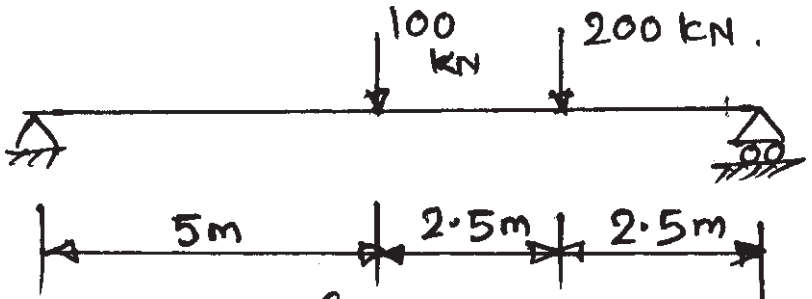

Fig Q. 12(a)

b) Determine the approximate values of bending moment, shear force, and axial force in the plane frame loaded as shown in fig. Q.12 (b) using cantilever method. The areas of cross-section of an interior column is 1.25 the area of outer column. **[12]**

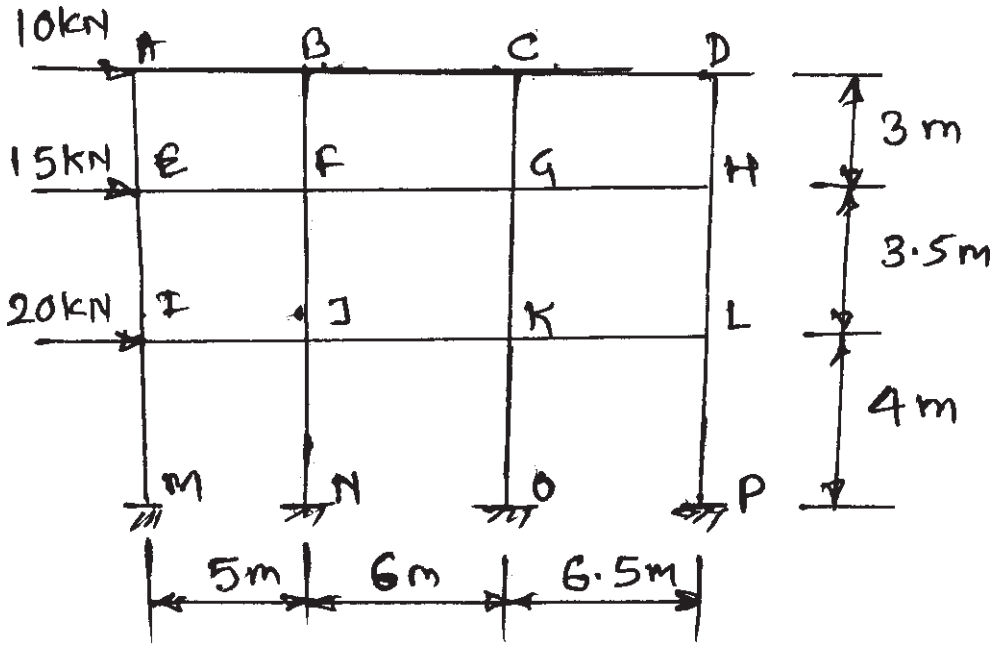

fig - Q. 12 (b)

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Total No. of Questions : 12]

P1053

SEAT No. : ____

[Total No. of Pages : 4

[4163] - 210
T.E. (Civil)
FOUNDATION ENGINEERING
(2008 Pattern) (Sem. - II)

Time : 3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer 3 questions from Section - I and 3 questions from Section - II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Your answers will be valued as a whole.***
5) ***Use of electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain the following : **[5]**

i) Significant depth.

ii) RQD.

b) How will you decide the depth of exploration & the number of barings? Discuss in the light of guide rules. **[6]**

c) Enlist the different methods for site investigation. Explain 'Seismic refraction' method in detail. **[6]**

OR

Q2) a) Explain the following : **[6]**

i) Area Ratio.

ii) Inside clearance.

iii) Chunk sampling.

b) Explain the steps for 'SPI' and correlations of 'N' for cohesive soils. **[6]**

c) Discuss 'Menard's pressure meter test'. **[5]**

P.T.O.

Q3) a) Compare different modes of shear failures. **[5]**

b) A rectangular footing 2m × 3m rests on a c - ϕ soil, with its base at 1.5m below the ground surface. Calculate i) SBC ii) Net ultimate BC. Using following data,
FOS = 03, γ = 18 kN/m^3, C = 10 kN/m^2, ϕ = 30°
Jerzaghi's BC factors,

ϕ	Nc	Nq	Nr
25°	25.1	12.7	9.7
30°	37.2	22.5	19.7

[6]

c) Describe stepwise 'Plate Load Test'. **[6]**

OR

Q4) a) Compare the effect of water table on BC of soil, for a footing 2m wide, located at a depth of 1.2m in sand with following data, **[6]**
γ = 16.8 kN/m^3, γ_{sat} = 19.5 kN/m^3, ϕ = 35°, N_q = 41.4, N_r = 42.4
i) Water table is 4m below GL.
ii) Water table is 1.2m below GL.

b) Explain the following : **[6]**
i) Limitations of plate load test.
ii) Effect of eccentricity on BC of soil.

c) Discuss 'Floating foundation'. **[5]**

Q5) a) Explain the following : **[6]**
i) Pressure bulb.
ii) Contact pressure distribution.
iii) Immediate elastic settlement.

b) A rectangular footing 2m × 3m carries a column load of 600 kN at a depth of 1m. The footing rests on a c - ϕ strata 6m thick, with μ = 0.25, E_s = 20,000 kN/m^2. Calculate the immediate elastic settlement of the rigid rectangular footing, assuming influence factor. **[5]**

c) Differentiate clearly between, **[5]**
i) Total settlement.
ii) Differential settlement.
iii) Talerable settlement.

OR

Q6) a) A strip footing 1.2m wide is located at a depth of 1.5m in a non-cohesine soil deposit for which the corrected 'N' of SPT is 20. Water table is located at a depth of 2m below GL. Find the allowable soil bearing pressure. **[6]**

b) Explain any one method for determination of coefficient of consolidation. **[5]**

c) An undisturbed sample of clay, 24 mm thick, consolidated 50% in 20 minutes, when tested in the laboratory with drainage allowed at top & bottom. The clay layer, from where the sample was obtained is 4m thick in the field. How much time will it take to consolidate 50%, with double drainage? Assume uniform distribution of consolidation pressure. **[5]**

SECTION - II

Q7) a) Explain pile classification, based on function. **[5]**

b) An RC pile weighing 30 kN is driven by a drop hammer weight 40 kN & having an effective fall of 0.8m. The average set per blow is 1.4 cm. The total temparary elastic compression is 1.8cm. Assuming the co-efficient of restitution as 0.25 & FOS = 2, determine the ultimate bearing capacity & the allowable load for the pile. **[6]**

c) Explain the 'cyclic pile load test'. **[6]**

OR

Q8) a) Explain the following, **[6]**

i) Negative skin friction.

ii) Feld's Rule.

b) In a 16 pile group, with 45 cm diameter & c/c spacing of the square group is 1.5M. If c = 50 kN/m^2, determine whether the failure would occur with the pile acting individually or as a group? Neglect end bearing & assume m = 0.7 for shear mobilisation. All piles are 10 m long. **[6]**

c) Explain 'Sinking of Caissons'. **[5]**

Q9) a) Explain the following. **[6]**

i) Pressure distribution for strutted excavations.

ii) Common types of cofferdams.

b) Compute the embedment depth & the pull in the anchor rod for a sheet pile, retaining back fill 6m high, with anchor rod 1m below the top & gwt 3m below the top. The soil of backfill & below the dredge line is the same, having the following properties, **[6]**

$\phi = \phi' = 30°$, $c = 0$, $\gamma_{sat} = 20$ kN/m^3 & $\gamma = 18$ kN/m^3. Use 'free earth support' method.

c) Discuss 'RC Diaphragm wall method', for cofferdam. **[5]**

OR

Q10)a) State the characteristics of BC soil and explain the role of 'Montmorillonite'. **[6]**

b) Explain the following, stating the method for its determination, **[6]**

i) Free swell.

ii) Differential swell.

iii) Swelling pressure.

c) Explain the steps for 'Vibro-floatation' method. **[5]**

Q11)a) Draw the sketech of 'Reinforced earth wall' & explain the following,**[6]**

i) Wall facing elements.

ii) Reinforcement.

iii) Compacted backfill.

b) Discuss the following : **[5]**

i) Different types of geosynthetics.

ii) Functional properties & requirements of geosynthetics.

c) Discuss 'geosynthetics applications in civil engg'. **[5]**

OR

Q12)a) Explain different types of earthquakes. **[6]**

b) What do you mean by 'Lique faction'? What are its effects on built environment? **[5]**

c) Discuss the methods applied for mitigation of lique faction Razard.**[5]**

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Total No. of Questions : 12]

P1054

SEAT No. : ____

[Total No. of Pages : 7

[4163] - 211
T.E. (Mechanical)
MACHINE DESIGN - I
(2008 Pattern) (Sem. - I)

Time : 4 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answers any 3 questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Unit - I

Q1) A steel shaft made of 40C8 is used to drive a machine. The pulleys X, Y and bearing A, B are located as shown in fig.1. Belt tensions are also shown in fig.1. Determine the diameter of the shaft using A.S.M.E. code. Yield strength of short material is 330 MPa and ultimate tensile strength is 600 MPa take K_b = 1.5 and K_t = 1.2. If rectangular key is made of the same material, design the key. **[16]**

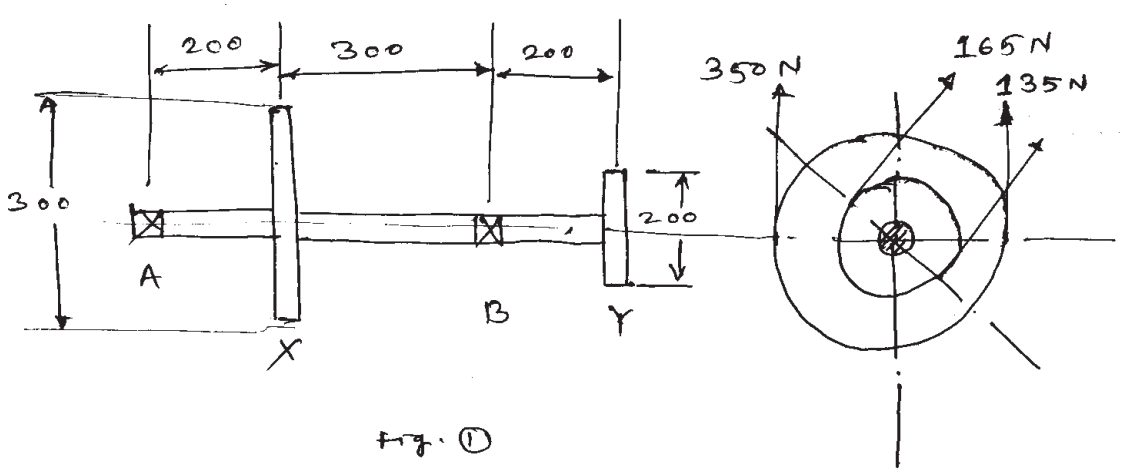


fig. ①

P.T.O.

OR

Q2) a) An automobile gear box uses a splined shaft to transmit power of 10kW at 1500 rpm. The spline used is designated 6 × 28 × 34. The bearing pressure is limited to 5 MPa. Calculate the length of splines in hub, based on bearing pressure criterion. Also determine force required to shift the gear if coefficient of friction is 0.05. **[4]**

b) A protected type rigid flange coupling used to transmit 25 kW power at 500 rpm from an engine to a machine. Design a coupling for an overload capacity of 25%. Assuming following permissible stresses for the components of a coupling. **[12]**

	CI (flange)	M.S. shaft + key	Plain carbon steel - bolt
Allowable tensile stress N/mm^2	20	60	60
Allowable shear stress N/mm^2	12	35	28
Allowable compressive stress N/mm^2	60	60	60

Unit - II

Q3) a) What does one mean by self-locking screws? Explain the condition for self-locking. Also give applications of self locking screw. **[4]**

b) A lead screw of a lathe has ACME threads of 50mm outer diameter and a pitch of 8mm the axial load on the lead screw is 3000N the thrust is carried by a collar of 120mm outer diameter and 60mm inner diameter. The lead screw rotates at 40 rpm. Find the power required to drive the screw and the efficiency of the screw. Assume friction in threads as 0.15 and that at the collar as 0.12. Evaluate the results based on uniform pressure theory and uniform wear theory. **[12]**

OR

Q4) A 26 × 5 square threaded, single start power screw is used to support a load of 12 kN. The effective diameter of collar is 46mm and the coefficient of friction is 0.15. The nut is made of phosphor bronze having 0.12 as coefficient of friction and 6 MPa as allowable bearing pressure the length of the handle is 300mm calculate. **[16]**

a) The force required to raise the load.

b) The force required to lower the load.

c) The yield strength of material for a factor of safety of 4.

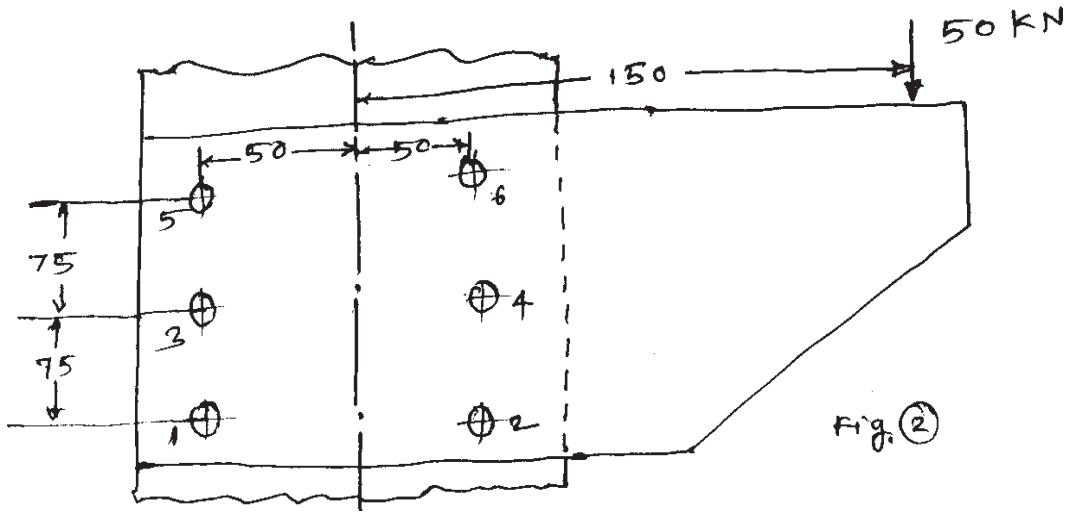
d) The overall efficiency of the screw and

e) The number of threads in nut.

Unit - III

Q5) a) Write a note on 'Bolts of uniform strength'. **[4]**

b) A bracket 13 bolted to a column by 6 bolts of equal size as shown in fig 2. It carries a load of 50 kN at the distance of 150mm. from the centre of column. If the maximum stress in the bolt is to be limited to 150 N/mm^2 determine the diameter of the bolt. **[14]**



OR

Q6) Fig. 3 shows a welded joint subjected to an eccentric load of 25 kN. The welding is only on one side. If the permissible shear stress for the weld material is 55 MPa determine the weld size. **[18]**

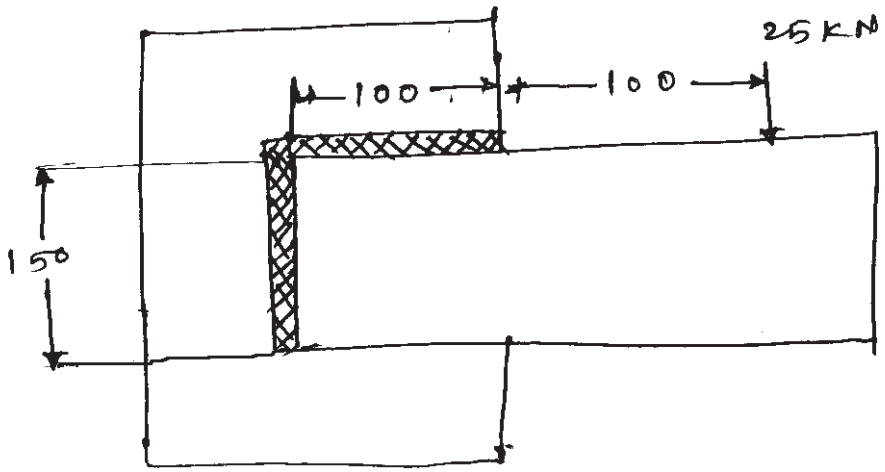


Fig (3)

SECTION - II

Unit - IV

Q7) a) What are the applications of flywheel? **[3]**

b) What is the coefficient of fluctuation of energy? **[3]**

c) The torque developed by an engine is given by the following equation:

$T = 14250 + 2200\sin 2\theta - 1800 \cos 2\theta$

Where T is the torque in N-m and θ is the crank angle from the IDC position. The resisting torque of the machine is constant throughout the work cycle. The coefficient of speed fluctuations is 0.01. The engine speed is 150 rpm. A solid circular steel disk, 50 mm thick is used as a flywheel. The mass density of steel is 7800 kg/m^3. Calculate the radius of the flywheel disk. **[12]**

OR

Q8) a) Explain the different types of stresses induced in **[6]**

i) Flywheel Rim

ii) Flywheel Arm

b) A rimmed flywheel made of gray cast iron FG 200 (ρ = 7100 kg/m^3) is required to keep down fluctuations in speed from 200 to 220 rpm. The cyclic fluctuations in energy is 30000 N-m, while the maximum torque during the cycle is 75000 N-m. The outside diameter of the flywheel should not exceed 2m. It can be assumed that there are six spokes and the rim contributes 90% of the required moment of inertia. The cross-section of the rim is rectangular and the ratio of width to thickness is 2. Determine the dimensions of the rim. Assuming suitable cross-section for spokes, calculate the stresses in the rim. **[12]**

Unit - V

Q9) a) Draw a neat sketch of a multi-leaf spring and show its essential parts. **[4]**

b) A helical compression spring is used to absorb the shock. The initial compression of the spring is 30 mm and it is further compressed by 50 mm while absorbing the shock. The spring is to absorb 250J of energy during the process. The spring index can be taken as 6. The spring is made of cold-drawn steel wire with an ultimate tensile strength of 1500 N/mm^2 and modulus of rigidity of 81370 N/mm^2. The permissible shear stress for the spring wire should be taken as 30% of the ultimate tensile strength. Design the spring and determine : **[12]**

i) Wire diameter

ii) No. of active turns

iii) Free length

iv) Pitch of the turns

OR

Q10)a) What is nipping of leaf spring? Why it is provided? **[4]**

b) A helical torsion spring for a window shade is made of patented and cold drawn steel wire of Grade-4. The yield strength of the material is 60% of the ultimate tensile strength and the factor of safety is 2. From space considerations, the mean coil diameter is kept as 18mm. The maximum bending moment acting on the spring is 250 N-mm. The modulus of elasticity of the spring material is 207000 N/mm^2. The stiffness of the spring should be 3 N-mm/rad. Determine the wire diameter and the number of active coils. **[12]**

(Sut_1 = 2290 N/mm^2) & (Sut_2 = 2250 N/mm^2)

Unit - VI

Q11)a) Derive the condition for maximum power transmitting capacity of belt drive based on belt strength and friction capacity. **[6]**

b) The following data is given for an open-type 'v' belt drive : **[10]**

diameter of driving pulley	= 150 mm
diameter of driven pulley	= 300 mm
centre distance	= 1m
groove angle	= 40°
mass of belt	= 0.25 kg/m
maximum permissible tension	= 750N
coefficient of friction	= 0.2

Determine the maximum power transmitted by the belt and the corresponding belt velocity. Neglect power losses.

OR

Q12)a) How wire ropes are designated? State their applications. **[4]**

b) A fibre core wire rope of 6 × 19 class tensile designation 1230 N/mm^2 is to be used in the mine hoist to raise the load of 500 kg. The maximum acceleration of the load is 1 m/s^2. The modulus of elasticity of the rope is 83 kN/mm^2. If the factor of safety required against static failure is 5. Select the size of the wire rope and the sheave. **[12]**

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Total No. of Questions : 12]

P1056

SEAT No. : ____

[Total No. of Pages : 4

[4163] - 213
T.E. (Mechanical) (Common to Automobile)
THEORY OF MACHINES - II
(2008 Pattern) (Sem. - I)

Time : 3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answers 3 questions from Section - I and 3 questions from Section - II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables electronic pocket calculator and is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I
Unit - I

Q1) a) A cone clutch transmits 20 kW at 1600 rpm. The following data apply cone angle = 30°; maximum intensity of pressure = 0.8×10^5 N/m^2 the mean radius is twice the width of the friction surface. Co-efficient of friction is 0.3. Determine **[8]**

i) The dimensions of the contact surfaces.

ii) The axial load or force to keep the clutch engaged when transmitting power.

iii) The width of the friction surface. Assume uniform wear.

b) Derive an expression for frictional torque of a collar thrust bearing assuming

i) uniform pressure ii) uniform wear **[8]**

OR

Q2) a) Describe the construction and working of Bevis-Gibson Torsion dynamometer **[6]**

b) A simple band brake applied on a drum of diameter 600 mm is shown in fig 1. The drum is rotating at 250 rpm. The angle of lap of the band on the drum is 270°. The co-efficient of friction between the drum & the steel band line with frictional material is 0.25.one end of the band is fastened to a fixed pin (fulcrum) and the other end to the brake lever arm at a distance of 150 mm from the fulcrum. The length of lever arm is 700 mm. the lever arm is so placed that the diameter that bisects the angle of lap is perpendicular to the lever arm. Determine: **[10]**

P.T.O.

i) The effort needed and its direction at the end of the lever to stop the drum, if a power of 35 kW has to be absorbed.

ii) Width of the steel band if maximum tensile stress in the band is not to exceed 40 N/mm^2. Assume band thickness as 2 mm.

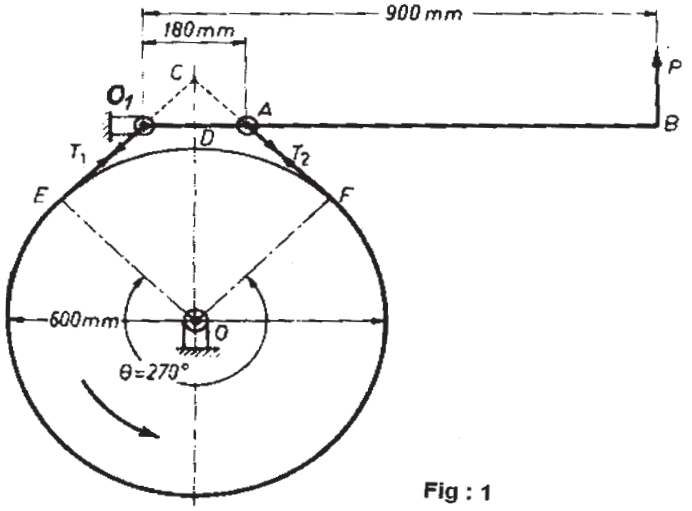

Fig : 1

Unit - II

Q3) Draw the cam profile for cam with roller reciprocating follower. The axis of the follower passes through the axis of the cam. Particulars of the cam and the follower motion are the following : **[16]**

Roller diameter = 5mm, Minimum radius of cam = 20mm and Total lift = 25mm. The cam has to lift the follower with SHM during 180^o of cam rotation, then allow the follower to drop suddenly half way and further return the follower with uniform velocity during the remaining 180^o of cam rotation. Determine the maximum velocity and maximum acceleration on the outstroke, if cam rotates at a uniform speed of 100 rpm.

OR

Q4) a) What is cam jump phenomenon? What are possible ways to avoid that?**[6]**

b) Derive an expression for displacement ,velocity and acceleration for a circular arc cam operating a flat faced follower: **[10]**

i) When the contact is on the circular flank and

ii) When the contact is on the circular nose.

Further find maximum velocity and maximum acceleration of the follower during cam rotation.

Unit - III

Q5) a) Explain the following terms : **[8]**

i) Height of governor.

ii) Radius of rotation of governor.

iii) Equilibrium speed of governor.

iv) Hunting of governor.

b) The wheels of a motor cycle have a moment of inertia of 3 kg-m^2 and the engine parts, a moment of inertia of 0.25 kg-m^2. The wheel axles and crank shaft of the engine are all parallel to each other. If the ratio of reduction gears is 5:1, the wheel diameter is 700mm, determine in magnitude and direction the gyroscopic couple when the motor cycle is negotiating a curve of 30 meters radius at a speed of 40 kilometers per hour. If the mass of motor cycle with rider is 205 kg with centre of gravity at 70 cm above the grand in vertical position, determine the speed of motor cycle rounding a curve of 60 m if the road condition and tyre permit a heel of 45°. **[10]**

OR

Q6) a) Explain by means of controlling force curves the following : **[8]**

i) Stable governor,

ii) Unstable governor,

iii) Isochronous governor

b) Give the comparison between flywheel and governor **[2]**

c) What is yawing, pitching and rolling with respect to naval ships? Explain with neat sketch. **[8]**

SECTION - II
Unit - IV

Q7) a) State and explain the terminology used for spur gear with neat sketch. **[8]**

b) Derive the equation for the minimum number of teeth for involute gears to avoid the interference as given **[8]**

$$T_{min} = \left[\frac{2}{\sqrt{1+3\sin^2\psi - 1}} \right]$$

Where ψ - pressure angle

OR

Q8) a) Compare between involute and cycloidal tooth profiles. **[4]**

b) The pressure angle of two gears in mesh is 20° and have a module of 10mm. The number of teeth on pinion are 24 and on gear 60. The addendum of pinion and gear is same and equal to one module. Determine **[12]**

i) the number of pairs of teeth in contact,

ii) the angle of action of pinion and gear, and

iii) the ratio of sliding to rolling velocity at the beginning of contact, at pitch point and at the end of contact.

Unit - V

Q9) a) Derive the relation for virtual number of teeth of helical gear. **[6]**

b) Draw neat sketch of bevel gear arrangement. **[6]**

c) A pair of single helical gears is required to give a speed reduction of 4.2:1. The gears are to have a normal module of 3mm, a pressure angle of 20° and a helix angle of 30°. If the shaft centre-lines are to be approximately 400mm apart, determine the number of teeth on each wheel and the exact centre distance. **[4]**

OR

Q10)a) Differentiate between worm and worm gear & bevel gears. **[4]**

b) Two shafts inclined at 70° are to be connected by spiral gears with a normal pitch of 12mm and to have a 2 to 1 velocity ratio. Determine the pitch diameters of the wheels and the spiral angles if the distance apart of the shafts is fixed at 125mm. Sliding of the teeth is to be a minimum as far as is practicable.

If the pinion rotates at 240 rev/min, what is the speed of sliding between the teeth. **[12]**

Unit - VI

Q11)Classify different types of gear trains with neat sketch, explanation with merit, demerits and application. **[18]**

OR

Q12)a) Explain Inertia of gear systems. **[6]**

b) In an epicyclic gear train, an arm carries two gears 1 and 2 having 40 and 50 teeth, respectively. The arm rotates at 160 rpm counter clockwise about the centre of gear 1, which is fixed. Determine the speed of the gear 2. sketch the arrangement. **[12]**

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Total No. of Questions : 12]

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SEAT No. : [ ]

[Total No. of Pages : 3

[4163] - 217
T.E. (Mechanical) (Common to Automobile)
METROLOGY AND QUALITY CONTROL
(2008 Pattern) (Sem. - II)

Time : 3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer 3 questions from Section - I and II each.***
2) ***Use of logarithmic tables, & Electronic pocket calculator are allowed.***
3) ***Assume suitable data.***
4) ***Answer 1 or 2, 3 or 4, 5 or 6, 7 or 8, 9 or 10, 11 or 12.***

SECTION - I

Q1) a) Describe use of four balls and height gauge for finding diameter of bore. **[6]**

b) Define roundness, errors in roundness and explain method of measurement of roundness. **[6]**

c) State Abbe principle of alignment. Explain it with suitable example. **[4]**

OR

Q2) a) Write a short note on Angle Dekkor. **[6]**

b) Write a short note on L.V.D.T. and it's application in metrology. **[6]**

c) What is difference between accuracy & precision. **[4]**

Q3) a) Calculate dimensions of ring gauge to control production of shaft of diameter 45 mm of type 'd8' following assumptions may be made.

i) ϕ 45 mm lies in diameter steps of 30-50mm.

ii) Upper deviation of a shaft is given by $(-16\ D^{0.44})$.

iii) $i = 0.45\ \sqrt[3]{D} + 0.001\ D$.

iv) IT8 = 25 i. **[10]**

b) Explain concept of RMS value for surface roughness. **[4]**

c) Differentiate between primary & secondary texture. **[4]**

OR

P.T.O.

Q4) a) Design GO and NOGO limit plug gauge for checking a hole having size $50^{+0.06}_{-0.00}$

Assume gauge maker's tolerance equal to 10% of work tolerance and wear allowance equal to 10% of gauge maker's tolerance. **[8]**

b) Explain working of LASER interferometer with neat sketch. **[5]**

c) Explain application of optical flat to check surface contours with suitable example. **[5]**

Q5) a) Describe Parkinson's gear tester with neat sketch. **[6]**

b) Explain working of profile projector with suitable example. **[6]**

c) Calculate chord length and its distance below the tooth tip for a gear of module 4mm and pressure angle 20°. **[4]**

OR

Q6) a) For M16 × 2mm external thread, calculate the best wire size diameter and difference between size under wire and effective diameter. **[6]**

b) Describe working of universal measuring machine. **[5]**

c) Write a short note on Automatic Inspection system. **[5]**

SECTION - II

Q7) a) What is cost of Quality? Explain cost of failure, cost of appraisal & cost of prevention. **[6]**

b) Explain the concept of Quality Circle & their structure, advantage & limitation. **[5]**

c) Explain Juran's Trilogy Approach with diagram. **[5]**

OR

Q8) a) Explain the seven problem solving tools of quality. **[7]**

b) Distinguish between Quality of design and Quality of conformance. **[5]**

c) What are the steps used to implement the Quality Policy. **[4]**

Q9) a) Explain Quality function Development & its benefits in TQM. **[6]**

b) Explain ISO 9000 Quality system standards. **[5]**

c) Discuss the concepts & uses of 5'S' & TPM. **[5]**

OR

Q10)a) Explain following terms : **[12]**

i) Kanban.

ii) JIT.

iii) FMECA.

b) Explain purpose of Quality Audit. **[4]**

Q11)a) Draw & Explain operating characteristics curve. **[6]**

b) Control chart for $\overline{X}$ is to be prepared for a certain dimension of component. The sub group size is 4. After 20 sub-groups it is found that $\Sigma\overline{X}$ = 825.60 & ΣR = 5.60 mm.

The specification limit of the part is 41.0 ± 0.40mm & above process is in control and it is normally distributed can it meet the specification requirement? d_2 for subgroup size 4 is equal to 2.059. **[8]**

c) Calculate sample size & AOQ for single sampling plan using following data : **[4]**

i) Probability of acceptance of 0.5% defectives in a lot is 0.525.

ii) Lot size = 10,000 units.

iii) Acceptance number C = 1.

iv) np = 1.5

v) Defectives found in the sample are not to be replaced.

OR

Q12)a) Explain different types of sampling plans & state relative merits & demerits. **[6]**

b) Explain DMAEC uses in six Sigma. **[4]**

c) Following given table shows the no. of defectives found in inspection of 9 lot of 100 items each. **[8]**

Lot Number	1	2	3	4	5	6	7	8	9
Number of defectives	6	3	1	4	3	11	5	2	3

Determine the controlled limit for fraction defective chart.

i) State Whether the process is in control.

ii) If not by eliminating outside control limit point, what will be the new control limit.

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Total No. of Questions : 12]

P1061

SEAT No. : ____

[Total No. of Pages : 7

[4163] - 218
T.E. (Mechanical)
TURBO MACHINES
(2008 Pattern) (Common to Mech. S/W) (Sem. - II)

Time : 3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer 3 questions from Section - I and 3 questions from Section - II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Unit - I

Q1) a) Derive the fundamental equation of fluid machines? How it is applied for turbines and pumps. **[6]**

b) A 1220 meters long pipe line with frictional coefficient 0.005 supplies three single jet Pelton wheels. The top water level of the reservoir being 370 meters above the nozzles. The coefficient of velocity for each nozzle is 0.98. The efficiency of each turbine based on head at nozzle is 85%. The head lost in pipe friction is 12.20 meters. The specific speed of each wheel is 15 and the working speed is 560 RPM. Find

i) The total power developed.

ii) The discharge.

iii) The diameter of each nozzle.

iv) Diameter of pipe line. **[10]**

P.T.O.

OR

Q2) a) Derive an expression for the specific speed of a hydraulic machine and explain how it is useful in practice. **[6]**

b) A jet discharges 0.15 m^3/sec of water with a velocity of 70 m/sec impinges without shock on a series of curved vanes which move in the same direction as the jet. The shape of each vane is such that it would deflect the jet through an angle of 150°. Surface friction reduces the relative velocity by 8 percent as the water passes across the vanes and there is further windage loss equivalent to $\left[\frac{0.5u^2}{2g}\right]$ N.m per N of water, u being the vane velocity. **[10]**

Find

i) The velocity on vanes corresponding to maximum efficiency.

ii) The value of this efficiency.

iii) Corresponding force on the vanes in and at right angles to the direction of their motion.

iv) The power of this arrangement

Unit - II

Q3) a) What do you understand by Thomas factor of cavitation and what it signifies for water turbines. **[4]**

b) An experimental inward flow reaction turbine rotates at 370 rpm. The wheel vanes are radial at inlet and outlet. The inner diameter of wheel is half of the outer diameter. The constant velocity of flow in the wheel is 2 m/sec. Water enters the wheel at an angle of 30° to the tangent to the wheel at inlet. The breadth of the wheel at inlet is 75 mm & area of flow blocked by vanes is 5% of gross area of flow at inlet. Draw inlet and outlet velocity triangles for the turbine and **[12]**

Find

i) The Net available head at inlet.

ii) The wheel vane angle at outlet.

iii) Outer and inner wheel diameter.

iv) Theoretical Power developed by the turbine also find overall efficiency if the mechanical efficiency is 87%.

OR

Q4) a) Two inward flow turbine runners A & B, having the same diameter of 0.5 meter have the same efficiency and work under the same head. Both the turbine have same velocity of flow of 5.6 m/sec. If one of the runners 'A' runs at 525 RPM and has inlet blade angle of 65° and other runner 'B' having inlet blade angle of 110° what should be the speed of the runner 'B'? Assume radial discharge for both the turbine at outlet. **[6]**

b) A propeller turbine has an outer diameter of 4.5 meter and inner diameter of 2.5 meters. It is developing 20 MW when working under a head of 20 meters. The turbine is directly coupled to an alternator having 22 pairs of poles. The hydraulic efficiency is 94% & the overall efficiency is 88%. Find the discharge through turbine. Find the runner vane angles at inlet and outlet at the hub and at the edge of the blade. **[10]**

Unit - III

Q5) a) Derive an expression for maximum Utilization factor (diagram efficiency) of Parson's reaction turbine in terms of nozzle angle. **[6]**

b) The total tangential force on one ring of Parson's turbine is 1200 N.when the blade speed is 100 m/s. The mass flow rate is 8 kg/s.The blade outlet angle is 20°. Determine blade velocity at outlet from the blade. If friction losses which would occur with pure impulse are 25% of the kinetic energy corresponding to the relative velocity at entry to each ring of blades, and expansion losses are 10% of the heat drop in blade, Determine the heat drop per stage, Stage efficiency, Blade efficiency and Maximum utilization factor. **[12]**

OR

Q6) a) Explain the essential differences in the manner of expansion of steam in impulse and reaction turbines. Illustrate your answer by sketches of pressure, velocity and specific volume changes which occur as the steam passes over successive blades. **[6]**

b) In a simple impulse turbine, the nozzles are inclined at 20° to the direction of motion of moving blades. The steam leaves the nozzle at 375 m/s .The blade speed is 165 m/s .Find suitable inlet and outlet angles for the blades in order that axial thrust is zero. The relative velocity of steam as it flows over the blade is reduced by 15% by friction. Determine also the power developed for steam flow rate of 10 kg/s and diagram efficiency. **[12]**

SECTION - II
Unit - IV

Q7) a) Prove that output of a simple gas turbine plant is positive only when the product of compressor and turbine efficiency is grater than $\left(\frac{T_1}{T_3}\right) R_p \left(\frac{\gamma-1}{\gamma}\right)$. Where R_p is pressure ratio,T_1 and T_3 are compressor and turbine inlet temperature. **[6]**

b) In a jet-propulsion unit air is compressed by means of uncooled rotary compressor, the pressure at the delivery being 3.5 times at the entrance, and the temperature rise during compression is 1.15 times that for frictionless adiabatic compression. The air is then led to combustion chamber where fuel is burned under constant pressure condition .The product of combustion at 480°C pass through a turbine which drives the compressor. The exhaust gases from the turbine are expanded in nozzle down to atmospheric pressure. The atmospheric temperature and pressure is 10°C and 1 bar. Assuming that values of R and Y after combustion same as that for air.

Estimate :

i) the power required to drive the compressor per kg/sec of air

ii) the air fuel ratio if calorific value of fuel is 43300 kJ/kg.

iii) static thrust developed per kg of air per second.

The velocity of approach may be neglected and the gases are expanded isentropically in both turbine and nozzle. **[10]**

OR

Q8) a) Prove that overall efficiency of a propulsion device is product of its thermal efficiency, Froude's efficiency (Propulsive efficiency) and transmission efficiency. **[6]**

b) An open cycle gas turbine plant operates with pressure ratio of 4.5 while using 82 kg/min. of air and 1.4 kg/min of fuel. The net output of plant is 200 kW when 230 kW is needed to drive the compressor. Air enters the compressor at 1 bar and 15°C and combustion gases enters the turbine at 765°C. Assuming specific heats of air and combustion gases as 1.005 and 1.128 respectively, the index of compression 1.4, the index of expansion 1.34 and mechanical efficiency for both compressor and turbine 0.98 each, **[10]**

Estimate;

i) Isentropic compressor efficiency.

ii) Isentropic turbine efficiency.

iii) Heat supplied in kW.

iv) Overall thermal efficiency of the plant.

Unit - V

Q9) a) Show that the rise of pressure in impeller of a centrifugal pump when frictional & other losses in the impeller are neglected is given $\frac{1}{2g}(vf_1^2 + u_2^2 - vf_2^2 cosec^2\phi)$ where all the symbols have their usual meaning. **[6]**

b) A centrifugal pump in which water enters radially delivers water to a height of 165 meters. The impeller has a diameter of 360 mm and width of 180 mm at inlet and corresponding dimensions at outlet are 720 mm and 90 mm respectively. Its rotational speed is 1200 rpm. The blades are curved back at an angle of 30° to the tangent at exit and discharge of the pump is 0.389 m^3/sec. **[12]**

Find :

i) The theoretical head developed.

ii) Manometric efficiency.

iii) Pressure rise across the impeller assuming losses to be 12% of exit velocity head.

iv) Pressure rise and loss of head in volute casing.

v) Inlet Vane angle

vi) Power required to drive the pump assuming overall efficiency of 70%. What would be corresponding mechanical efficiency?

OR

Q10)a) Discuss the influence of blade angles on performance of the centrifugal pump. **[6]**

b) The difference between the water levels in the sump and overhead tank is H. What additional head the pump should generate? **[4]**

c) A centrifugal pump impeller has an external diameter of 500 mm and a discharge area of 0.15 m^2. The vanes are set back at an angle of 30° to the tangent at exit. The diameters of suction and delivery pipe are 300 mm and 250 mm respectively. Pressure gauge at points on suction and delivery pipe fitted close to pump & at a height of 1.75 meters above the level in supply sump showed gauge pressure heads of 3.6 meter below and 20 meters above the atmospheric pressure head respectively when the pump is delivering 225 liters of water per second at 820 rpm. If it requires 73.58 KW to drive the pump **[8]**
Find

i) The loss of head in suction pipe.
ii) Manometric efficiency.
iii) Overall efficiency

Unit - VI

Q11)a) A centrifugal compressor delivers 10 m^3/s of air when running at 10,000 rpm. The air is drawn in at 1 bar and 300K and delivered at 4 bar. The isentropic efficiency is 80 %. Blades are radial at outlet and constant flow velocity is 64 m/s .The outer diameter of impeller is twice the inner and slip factor may be taken as 0.9. **[10]**
Calculate:

i) Temperature of air at outlet.
ii) Power required to drive the compressor.
iii) Impeller diameter at inlet and outlet.
iv) Impeller blade angle at inlet.
v) Diffuser blade angle at inlet (α_2).

b) Compare axial flow compressor and centrifugal compressor on the following points

i) range of operation within surging and chocking limits
ii) effect on performance when working with contaminated fluids
iii) isentropic efficiency
iv) pressure ratio per stage
v) Delivery pressure possible
vi) multistaging limits. **[6]**

OR

Q12)a) An axial flow compressor is required to deliver 50 kg/s of air at a stagnation pressure of 5 bar. At inlet to first stage the stagnation pressure is 1 bar and stagnation temperature is 300 K. The hub and tip diameters at this location are 0.436m and 0.728m .At mean radius,which is constant through all stages of the compressor, the reaction is 0.5 and absolute air angles at stator exit is 28.8° for all stages. The speed of rotor is 8000 rpm. **[10]**

Determine the number of similar stages needed, assuming polytrophic efficiency is 0.89 and that the axial velocity at the mean radius is constant through the stages equal to 1.05 times the average axial velocity.

b) Discuss the dimensionless parameters used to predict the performance characteristics of centrifugal and axial flow compressor. State the importance of same. **[6]**

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Total No. of Questions : 12]

P1063

SEAT No. : ____

[Total No. of Pages : 8

[4163] - 220
T.E. (Mechanical)
REFRIGERATION AND AIR CONDITIONING
(2008 Pattern) (Sem. - II)

Time : 3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer any 3 questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I
Unit - I

Q1) a) A Bell Coleman Refrigerator working between 100kPa and 700kPa, maintains cold chamber at - 13°C. Air is compressed according to $PV^{1.3} = C$. It gets cooled to 37°C before expansion. The index of expansion is 1.35. **[8]**

Calculate :

i) Theoretical C.O.P.

ii) Mass flow rate of air to manufacture ice at 0°C from water at 30°C, at the rate of 5000kg per day

iii) Power required to run the plant

For air, take C_p = 1kJ/kgK, γ = 1.4

Latent heat of fusion of ice = 336kJ/kg.

Specific heat of water = 4.187kJ/kgK.

b) Define the following : **[8]**

i) EER

ii) SEER

iii) IPLV or APLV

OR

P.T.O.

Q2) a) What are the reasons for employing air cycle systems to aircraft and missiles. **[6]**

b) Explain with neat diagram construction and working of thermoelectric refrigeration. **[10]**

Unit - II

Q3) a) Describe the effect of superheat, undercooling, suction temperature and condensing temperature on the performance of working of VCC. **[6]**

b) A food storage lockers requires a refrigeration system of 2400kJ/min capacity at an evaporate temperature of 263K and a condenser temperature of 303K. The refrigerant used is Freon - 12 and subcooled by 6°C before entering the expansion valve and vapour is superheated by 7°C before leaving the evaporator coil. The compression of refrigerant is reversible adiabatic. The refrigeration compressor is two cylinder single acting with stroke equal to 1.25 times the bore and operates at 100r.p.m. **[12]**

Properties of Freon - 12

Saturation temp. K	Absolute pressure bar	Specific volume vapour m^3/kg	Enthalpy		Entropy	
			Liquid kJ/kg	Vapour kJ/kg	Liquid kJ/kgK	Vapour kJ/kgK
263	2.19	0.0767	26.9	183.2	0.1080	0.7020
303	7.45	0.0235	64.6	199.6	0.2399	0.6854

Take Liquid specific heat = 1.235kJ/kgK, vapour specific heat = 0.733kJ/kgK.

Determine :

i) Refrigerating effect per kg.
ii) mass of refrigerant to be circulated per minute,
iii) theoretical piston displacement per minute,
iv) theoretical power required to run the compressor, in kW,
v) heat removed through condenser per min., and
vi) theoretical bore and stroke of compressor.

OR

Q4) a) In an aqua ammonia vapour absorption plant, heat is supplied to generate by condensing steam at 2 bar and 0.9 dry. The evaporator is maintained at 5°C. **[8]**

Assuming the ambient temperature as 30°C, calculate maximum possible C.O.P. Condensate leaves the generator at 30°C.

If actual C.O.P. is 70% of the maximum COP, calculate the mass of steam required per day for a plant capacity of 20TR.

Take saturation temperature at 2 bar as 120°C and enthalpy of evaporation as 2200kJ/kg.

b) Explain practical vapour absorption with a neat diagram. **[5]**

c) List the different properties of ideal refrigerant, absorbent and refrigerant absorbent combination which are used in vapour absorption refrigeration system for its efficient working. **[5]**

Unit - III

Q5) a) What do you mean by RRR? Explain. **[4]**

b) What are the advantages of compound compression with intercooler over single stage compression? **[4]**

c) Explain : GWP, ODP, TEWI. **[8]**

OR

Q6) a) In a Cascade system of 40TR capacity is having evaporator temperature of 50°C and condenser temperature of 25°C. **[10]**

The load at - 50°C is absorbed by R - 22 unit and is rejected to cascade condenser at - 20°C. The cascade condenser is cooled by a unit R - 12 is subcooled to 20°C and no subcooling of R - 22. The vapours leaving both evaporators is dry and saturated. Compression is isentropic. Determine

i) Compression ratio for each unit
ii) Theoretical power required to run the system
iii) COP of each unit
iv) COP of the total system.

b) Explain a two stage compression system with liquid intercooler. **[6]**

Properties of R-22 :

Sat. Temp. (°C)	Sat. Pr. bar	Specific enthalpy kJ/kg		
		hf	hfg	hg
– 50	0.66	–	234.5	225
– 20	2.49	21	–	256

SECTION - II

Unit - IV

Q7) a) Define and explain significance of WBT and Bypass Factor. **[4]**

b) Without using Psychrometric chart, calculate Humidity ratio, Relative humidity and Enthalpy of Moist air sample having DBT = 38°C and DPT = 15°C. Take Total Pressure of the sample = 1 bar. **[6]**

c) Outdoor air at 24°C DBT and 15°C WBT passes through a washer in which water is recirculated. The washer has humidifying efficiency of 70%. It is then heated by a coil with coil surface temperature of 27°C and bypass factor of 0.3. Find the DBT and RH. of the air leaving the heater. Also determine the capacities of humidifier and heating coil if the circulation of outdoor air is 50 cmm. **[8]**

OR

Q8) a) Write a note on Air Washer. **[6]**

b) Write a note on Chemical (Desiccant) dehumidification. List some solid and liquid desiccants. **[6]**

c) 40 cmm of air at 31°C DBT and 19°C WBT is passed over the cooling coil whose surface temperature is 5°C. The coil cooling capacity is 4 TR under the given conditions of air. Determine DBT and WBT of the air leaving the cooling coil. Also calculate Bypass factor of cooling coil. **[6]**

Unit - V

Q9) a) Explain working of capillary tube and list its advantages and disadvantages. **[6]**

b) Write a note on Variable Refrigerant Flow system. **[6]**

c) Explain charging procedure of refrigeration system. **[4]**

OR

Q10)a) Write a note on Types of Condensers and specify application of each type. **[6]**

b) Write a note on All Year Air Conditioning system. **[6]**

c) List precautions to be taken for trouble free operation of Domestic refrigerator. **[4]**

Unit - VI

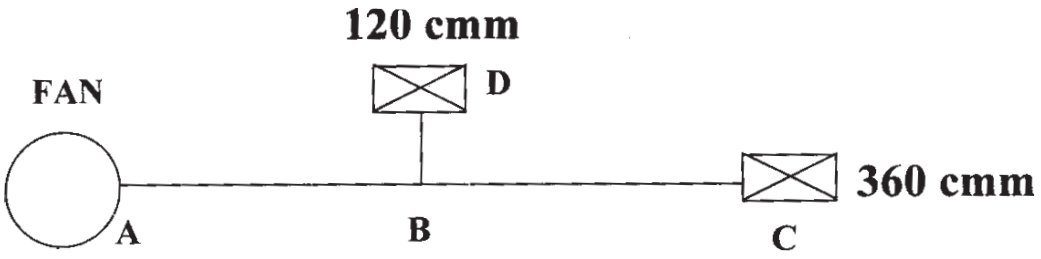
Q11)a) Explain Equal Friction Method of Duct Design. List its advantages and disadvantages. **[6]**

b) Explain methods of Food Preservation. **[6]**

c) Write a note on Individual Quick Freezing (IQF). **[4]**

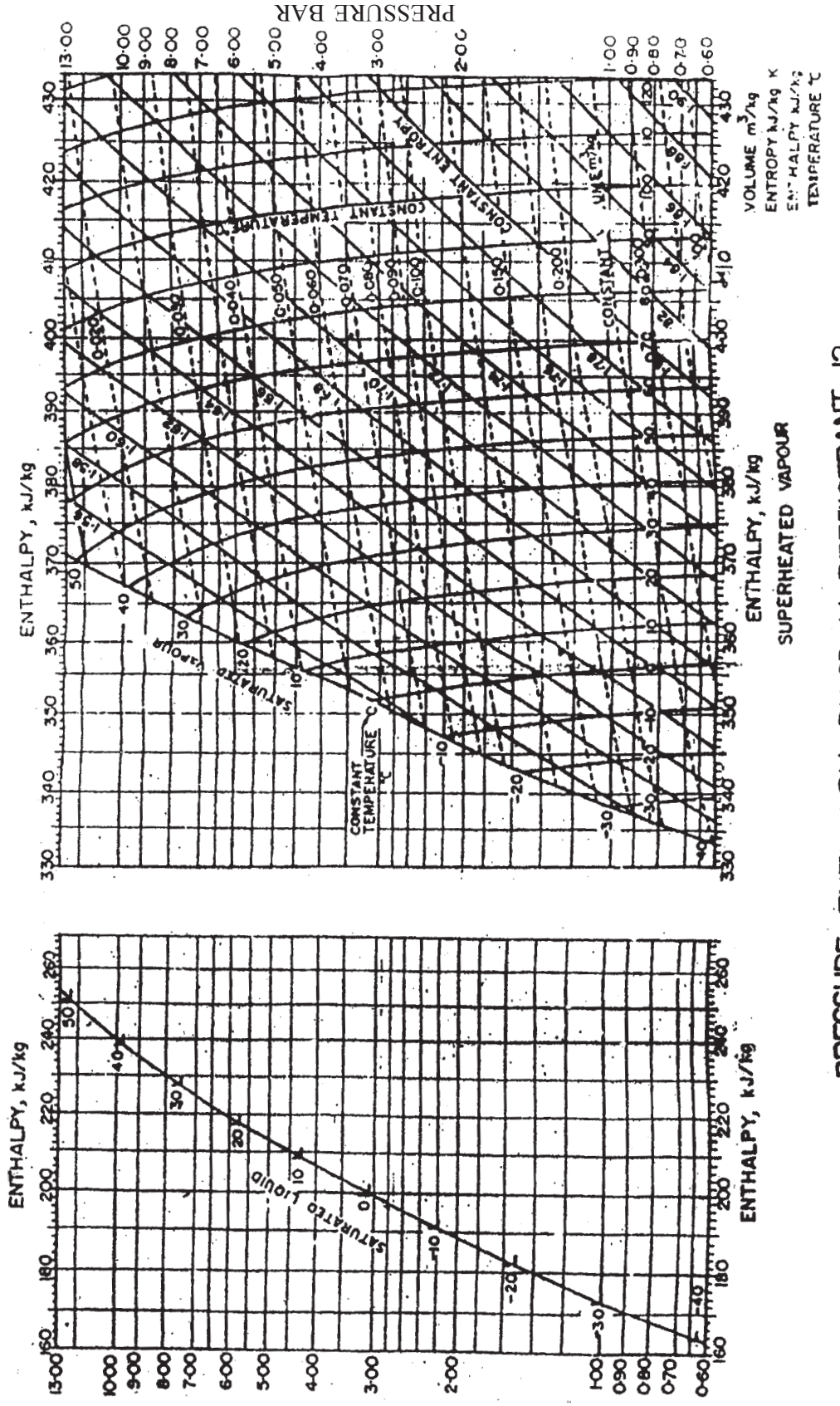
OR

Q12)a) Using Equal Friction Method, determine the Duct Diameter and Velocity for Section AB, BD and BC. Assume Velocity in the main duct AB = 600 m/min. Also calculate maximum pressure drop in the duct system. Distance AB = 30m. Distance BC = 30m. Distance BD = 10 m. **[6]**



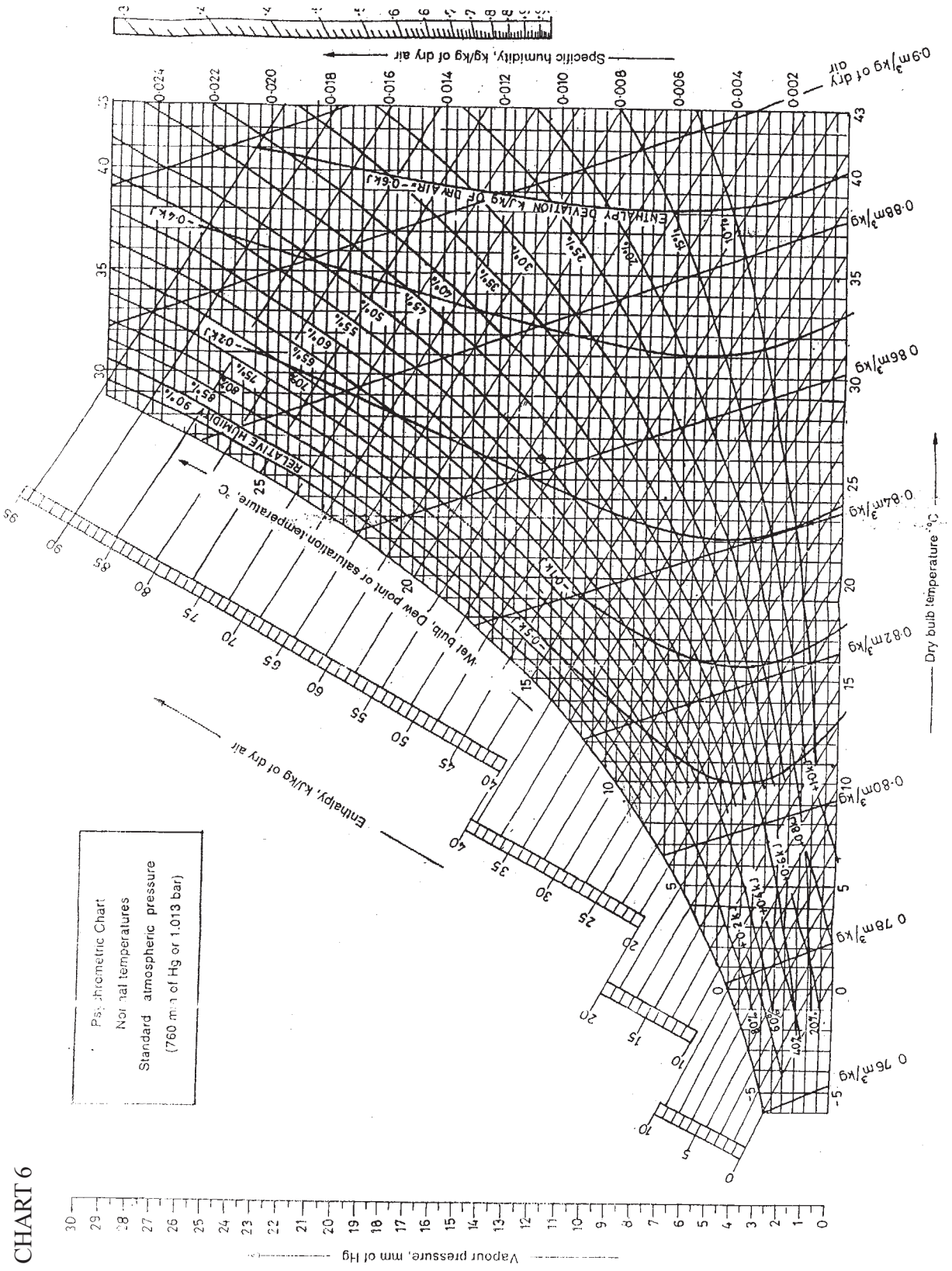
b) A rectangular duct 0.15m × 0.12m is 20m long and carries standard air at the rate of 0.3 m^3/s. Calculate the total pressure required at the inlet of the duct in order to maintain this flow and the air power required. Take friction factor, f = 0.005. **[6]**

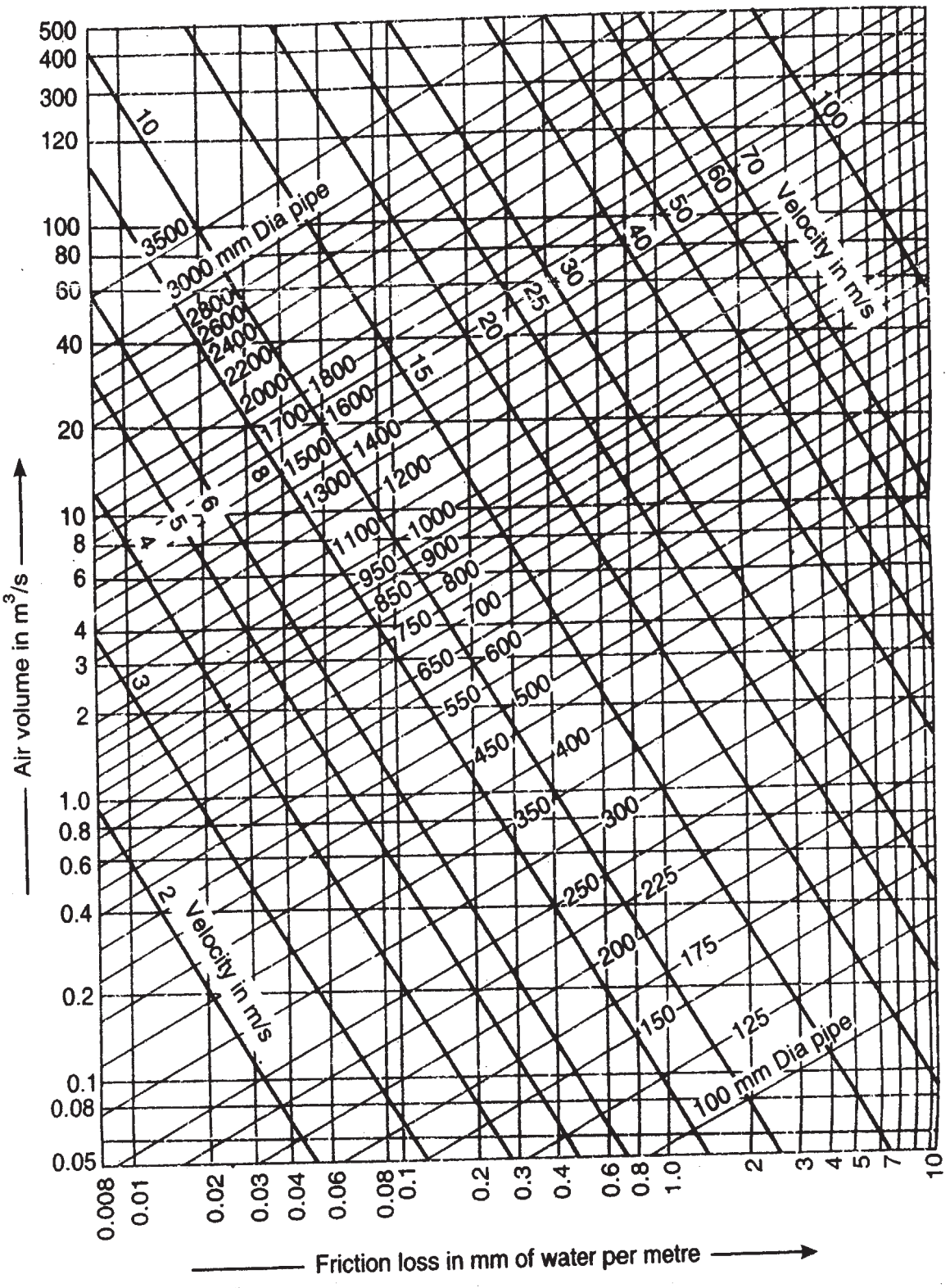
c) Write a note on Fan Laws. **[4]**



PRESSURE-ENTHALPY DIAGRAM, REFRIGERANT 12

CHART 6


Psychrometric Chart
Normal temperatures
Standard atmospheric pressure
(760 mm of Hg or 1.013 bar)
Enthalpy, kJ/kg of dry air
Wet bulb, Dew point or saturation temperature, °C
Specific humidity, kg/kg of dry air
Dry bulb temperature °C
Vapour pressure, mm of Hg
RELATIVE HUMIDITY
ENTHALPY DEVIATION kJ/kg OF DRY AIR



Friction chart for circular ducts.

❖ ❖ ❖ ❖

Total No. of Questions : 12]

P1066

SEAT No. :

[Total No. of Pages : 7

[4163] - 224
T.E. (Mechanical S/W)
THEORY OF MACHINE AND MACHINE DESIGN - II
(2008 Pattern) (Sem. - II)

Time : 4 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer 3 questions from Section - I and 3 questions from Section - II.***

2) ***Answers to the two sections should be written in separate books.***

3) ***Neat diagrams must be drawn wherever necessary.***

4) ***Figures to the right indicate full marks.***

5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***

6) ***Assume suitable data, if necessary.***

SECTION - I
UNIT - I

Q1) a) Explain precision points for function generation. **[6]**

b) Design a four bar mechanism with input link l_2, coupler link l_3 and output link l_4. Angles θ and ϕ for three successive positions are given in table below :

Position	1	2	3
θ	40°	55°	70°
ϕ	50°	60°	75°

If the grounded link l_1 = 30 mm, using frudenstein's equation, find out lengths of other links to satisfy the given positional conditions. Also draw the synthesized mechanism in its first position. **[10]**

OR

P.T.O.

Q2) The roller following a cam moves with S.H.M during ascent and with uniformly accelerated & deaccelerated motion during descent. The cam rotates at 370 rpm. Draw the cam profile for the following data.

a) Least radius of cam = 60 mm

b) Angle of ascent = 54°

c) Angle of dwell between ascent & descent = 48°

d) Angle of descent = 66°

e) Lift of the follower = 50 mm

f) Roller diameter = 30 mm

g) Offset of follower axis = 20 mm towards right.

Determine the maximum velocity & acceleration of follower during ascent and descent. **[16]**

UNIT - II

Q3) a) Two involute gears in mesh have a module of 8 mm and a pressure angle of 20°. The larger gear has 57 while the pinion has 23 teeth. If the addendum on pinion and gear wheels are equal to one module, find the, **[10]**

i) Contact ratio (the no. of pairs of teeth in contact).

ii) Angle of action of the pinion and the gear wheel.

iii) Ratio of the sliding to rolling velocity at the

1) Beginning of contact.

2) end of contact.

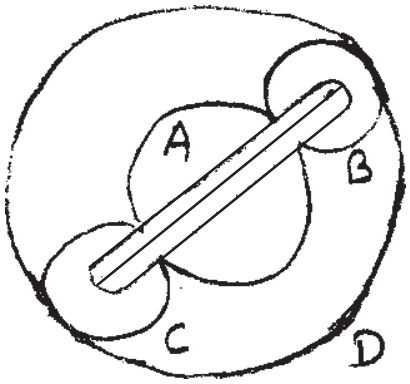
b) With neat sketch discuss force analysis and torque transmitted by helical gears. **[6]**

OR

Q4) a) An epicyclic gear train is arranged as shown in fig. How many revolutions does the arm, to which the pinions B & C are attached make : **[10]**

i) When A makes one revolution clockwise and D makes half a revolution anti clockwise. And

ii) When A makes one revolution clockwise & D is stationary.
The number of teeth on gears A & D are 40 & 90 respectively.



b) Derive an expression for virtual number of teeth for helical gears. **[6]**

UNIT - III

Q5) a) Explain working of cone clutch with neat sketch. **[4]**

b) Explain the working of Rope brake dynamometer, with neat sketch.**[4]**

c) A band and block brake having 12 blocks each of which subtends an angle of 16° at the centre, is applied to a rotating drum with a diameter of 600 mm. The blocks are 75 mm thick. The drum & the flywheel mounted on the same shaft have a mass of 1800 kg & have a combined radius of gyration of 600 mm. The two ends of the band are attached to pins on the opposite sides of the brake fulcrum at distances of 40 mm & 150 mm from it. If a force of 250 N is applied on the lever at a distance of 900 mm from the fulcrum find the,

i) maximum braking torque.

ii) Angular retardation of the drum.

iii) time taken by the system to be stationary from the rated speed of 300 rpm.

Take co-efficient of friction between blocks & the drum as 0.3.**[10]**

OR

Q6) a) An engine developing 45 kW at 1000 rpm is fitted with a cone clutch built inside the flywheel. The cone has a face angle of 12.5° and a maximum mean diameter of 500 mm. The co-efficient of friction is 0.2. The normal pressure on the clutch face is not to exceed 0.1 N/mm^2. Determine, **[8]**

i) The axial spring force necessary to engage the clutch.

ii) The face width required.

b) Explain the terms : **[6]**

i) Precessional angular motion.

ii) Gyro scopic couple.

c) What is stabilization of ship? Why is it necessary? How it is achieved? **[4]**

SECTION - II
UNIT - IV

Q7) a) It is required to design a pair of spur gears with 20° full depth involute teeth consisting of a 20 teeth pinion meshing with a 50 teeth gear. The pinion shaft is connected to a 22.5 kW, 1450 rpm electric motor. The starting torque of the motor can be taken as 150% of the rated torque. The material for the pinion is plain carbon steel Fe 410 (Sut = 410 N/mm^2), while the gear is made of grey cast iron fG 200 (Sut = 200 N/mm^2). The factor of safety is 1.5. Design the gears based on the lewis equation and using velocity factor to account for the dynamic load. Given-Lewis form factors for 20 and 50 teeth are 0.32 & 0.408 respectively. **[12]**

b) Discuss types of gear teeth failures. **[4]**

OR

Q8) a) Define the following terms in case of a worm gear with neat sketch. **[6]**

i) axial pitch.

ii) lead and lead angle.

b) 1 kW power at 720 rpm is supplied to the worm shaft. The number of starts for threads of the worm is four with a 50 mm pitch circle diameter. The worm wheel has 30 teeth with 5 mm module. The normal pressure angle is 20°. Calculate the efficiency of worm gear drive and the power lost in friction. **[10]**

Assume co-efficient of friction is 0.035.

UNIT - V

Q9) a) A dry single plate clutch is to be designed for an automotive vehicle whose engine is rated to give 100 kW at 2400 rpm and maximum torque 500 N.m. The outer radius of the friction plate is 25%more than the inner radius. The intensity of pressure between the plate is not to exceed 0.07 N/mm^2. The co-efficient of friction may be assumed equal to 0.3. The helical springs required by this clutch to provide axial force necessary to engage the clutch are eight. If each spring has stiffness equal to 40 N/mm. Determine the dimensions of the friction plate & initial compression in the springs. Assume uniform wear condition. **[12]**

b) Discuss in detail design considerations of a friction clutch. **[6]**

OR

Q10)a) Write a short note on "Bearing failure - causes & Remedies". **[6]**

b) For a 360° hydrodynamic Bearing, consider following data : **[12]**

i) Radial load = 3.2 kN

ii) Journal diameter = 50 mm

iii) Bearing length = 50 mm

iv) Journal speed = 1490 rpm

v) Radial clearance = 50 μm

vi) Viscosity of lubricant = 25 Cp

vii) Density of lubricant = 860 kg/m^3

viii) Specific heat of lubricant = 1.76 kJ/kg°C.

Assuming that the total heat generated in the bearing is carried by the total oil flow in the bearing, calculate,

1) minimum oil film thickness.

2) co-efficient of friction.

3) power lost in friction

4) the total flow rate of lubricant in μ min,

5) side leakage.

l/d	∈	h°/c	s	ϕ	(r/c)f	α/r Cns.l	ϕ/αs
1.0	0.4	0.6	0.264	63.10	5.79	3.99	0.497
	0.6	0.4	0.121	50.58	3.22	4.33	0.680
	0.8	0.2	0.0446	36.24	1.70	4.62	0.842

UNIT - VI

Q11)a) Explain the terms with neat sketches : **[8]**

i) Soderberg diagram.

ii) Goodman diagram

iii) Modified Goodman diagram.

b) A cantilever beam made of cold drawn carbon steel of circular cross-section as shown in fig. is subjected to a load which varies from – f to 3f. Determine the maximum load that this member can withstand for an in definite life using a factor of safety as 2. The theoretical stress concentration factor is 1.42 & notch sensitivity is 0.9. Assume the following valves : **[8]**

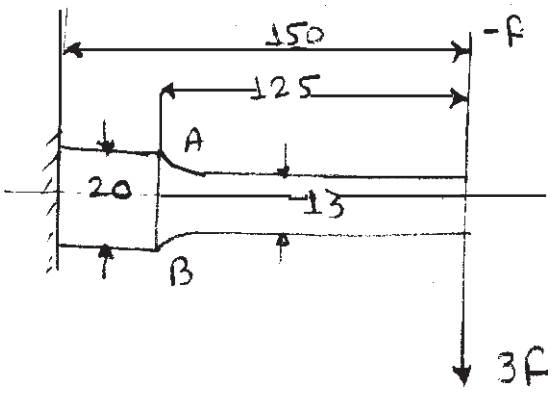
Ultimate stress = 550 MPa

Yield stress = 470 MPa

Endurance limit = 275 MPa

Size factor = 0.85

Surface finish factor = 0.89



OR

Q12)a) Explain the effect of following modifying factors on endurance strength.

i) Surface finish factor.

ii) Size factor.

iii) Reliability factor.

iv) Modifying factor to account stress concentration. **[8]**

b) A simply supported beam has a concentrated load at the centre which fluctuates from a value of P to 4P. The span of the beam is 500 mm. And its cross-section is circular with a diameter of 60 mm. Taking for the beam material an ultimate stress of 700 MPa, a yield stress of 500 MPa, endurance limit of 330 MPa for reversed bending. And a factor of safety of 1.3, calculate the maximum value of P. Take a size factor of 0.85 and a surface finish factor of 0.9. **[8]**

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Total No. of Questions : 12]

SEAT No. : ____

P1068

[Total No. of Pages : 4

[4163] - 226

T.E. (Mechanical S/W)

MECHATRONICS

(2008 Pattern) (Sem. - II)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:-

1) ***Answer 3 questions from section I and 3 questions from section II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
5) ***Assume suitable data, if necessary.***
6) ***Figures to the right indicate full marks.***

SECTION - I

Unit - I

Q1) a) Define the following static performance characteristics of instruments: **[6]**

i) Range and span ii) Hysteresis
iii) Precision iv) Sensitivity
v) Resolution vi) Zero drift

b) What is transduction principle? Classify transducers based on transduction principle. **[4]**

c) A Chromel-Alumel thermocouple is assumed to have nearly linear operating range upto 1100ºC with emf 45.14 mV (Reference temp. 0ºC) at this temperature. The thermocouple is exposed to a temperature of 840ºC. The potentiometer is used as cold junction and its temperature is estimated to be 25ºC. Calculate the emf indicated on the potentiometer. **[6]**

OR

Q2) a) What is meant by temperature compensation in strain gauges? How it is done. **[6]**

b) Explain various types of filters used in electronic circuits. **[6]**

c) Write a short note on Bimetallic strip used in temperature measurement. **[4]**

Unit - II

Q3) a) Explain with neat sketch construction and working of LVDT. **[6]**

b) Explain capacitive and inductive principles used in position sensing. **[6]**

P.T.O.

c) A rotary potentiometer is used for angle measurement. Potentiometer is supplied with 10 V and is set at 82º. The range of this single turn potentiometer is 350º. Calculate the output voltage. **[4]**

OR

Q4) a) Explain with neat sketch absolute encoder. **[6]**

b) Compare LVDT with potentiometer. **[4]**

c) The output of LVDT is connected to a 5V voltmeter through an amplifier of amplification factor 250. The voltmeter scale has 100 divisions and the scale can be read to $1/5^{th}$ of a division & output of 2 mV appears across the terminals of the LVDT when the core is displaced through a distance of 0.5mm. Calculate **[6]**

i) The sensitivity of LVDT

ii) The sensitivity of whole setup

iii) The resolution of the instrument in mm.

Unit - III

Q5) a) What is Nyquist frequency? Explain sample and hold circuit with neat sketch. **[6]**

b) Deduce the equation for torque, involved in rotational mechanical system with spring, mass and damper. **[6]**

c) Consider a thermocouple which has a transfer function, linking its voltage output and temperature input, of **[6]**

$$G(s) = \frac{30 \times 10^6}{10s + 1}\ ;\ V/^oC$$

Determine the response of the system when subject to a step input of size 100ºC and hence the time taken to reach 95% of the steady state value.

OR

Q6) a) Explain in detail any digital to analog conversion method. **[6]**

b) Explain SCADA with neat block diagram. List the applications of SCADA. **[6]**

c) Define transfer function. Show that the overall transfer function for the system given below in fig .1 is **[6]**

$$T(s) = \frac{G(s)}{1 - G(s)H(s)}$$

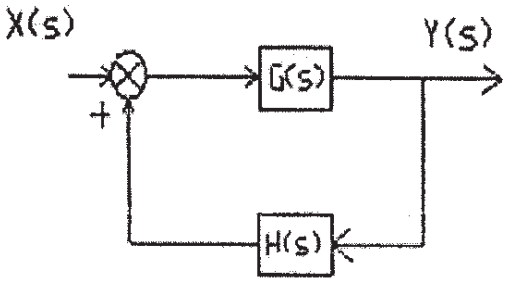


fig 1.

SECTION - II

Unit - IV

Q7) a) Explain open loop control system with suitable example. **[5]**

b) Write a short note on:- **[6]**

i) Self regulation ii) Process Lag

c) Derive the expression of transfer function for closed loop control system. **[5]**

OR

Q8) a) A controller outputs a 4 to 20mA signal to control motor speed from 140 rpm to 600 rpm with a linear dependence. Calculate: **[6]**

i) Current corresponding to 310 rpm &

ii) the value of above mentional current expressed as the percentage of control output.

b) Compare open loop control system and closed loop control system. **[5]**

c) Explain the following terms: **[5]**

i) Dead time ii) Error

Unit - V

Q9) a) Explain Derivative control mode and state its characteristics. **[5]**

b) Write a short note on:- **[6]**

i) proportional band

ii) repeats per minute

iii) Rate gain

c) A liquid level control system linearly converts a displacement of 2 to 3m into 4-20 mA control signal. A relay serves as the two position controller to open or close an inlet valve. The relay closes at 12mA and opens at 10mA. Find: **[5]**

i) the relation between displacement level and current.

ii) the neutral zone or displacement gap in meters.

OR

Q10)a) Explain proportional control mode and state its characteristics. **[6]**

b) An integral controller is used for speed control with a setpoint of 12 r.p.m. within a range of 10 to 15 rpm. The controller output is 22% initially. The constant K_I = –0.15% controller output per second per percentage error. If the speed jumps to 13.5 rpm. Calculate the controller output after 2s for a constant ep. **[6]**

c) Sketch the responses of P+I+D controller for **[4]**

i) step ii) pulse

iii) ramp and iv) sinusoidal inputs.

Unit - VI

Q11)a) Explain the application of PLC used in **[12]**

i) Washing machine ii) Dish washer

b) State various factors to be considered for the selection of PLC. **[6]**

OR

Q12)a) Explain any one application of PLC with a neat sketch and also draw its ladder diagram. **[12]**

b) Write a short notes on:- **[6]**

i) Internal relays and counters.

ii) Timers.

Total No. of Questions : 12]

SEAT No. :

P1069

[Total No. of Pages : 2

[4163] - 231

T.E. (Production Engg.)

METROLOGY AND MECHANICAL MEASUREMENT

(2008 Pattern) (Sem. - I)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, wherever necessary.***

SECTION - I

Q1) a) Explain with neat sketches different types of errors in measurement. **[8]**

b) Explain in detail manufacturing and care of slip gauges. **[8]**

OR

Q2) a) Differentiate in Accuracy and Precision of measurement. **[8]**

b) Explain with neat sketch principle of working of Autocollimator. **[8]**

$\sqrt[3]{D}$

Q3) a) Sketch and explain construction and working of Johanson Mikrocator. **[8]**

b) Design general purpose type GO and NO-GO gauge for checking the shaft Φ 70 f7

Given:

i) $FD = -5.5D^{0.41}$

ii) IT 7 = 16i

iii) i = 0.45 × + 0.001D

iv) 70mm lies in diameter range 50-80mm. **[10]**

OR

Q4) a) What is circularity? Explain the method of measurement of circularity with neat sketch. **[8]**

b) Design general purpose type Go and NOGO gauge for measurement of hole 60 H6

Given: **[10]**

i) IT 6 = 10i

ii) i = 0.45 × + 0.001D

iii) 60 mm lies in diameter range 50-80 mm.

P.T.O.

Q5) a) Describe with neat sketch Taylor-Hobson Surface meter. **[8]**

b) Explain with neat sketch two wire method of measurement of Effective Diameter of thread. **[8]**

OR

Q6) a) Describe with neat sketch Constant chord method of Gear tooth thickness Measurement. What are the advantages of this method over other methods. **[8]**

b) Explain with neat sketch Machine vision system. **[8]**

SECTION - II

Q7) a) What is measuring system? Explain with neat sketch generalized measuring system. **[8]**

b) What is sensor? Describe selection criteria for the different types of sensors. **[8]**

OR

Q8) a) What are types of transducers? Explain with neat sketch electrical transducer. **[8]**

b) What is input-output configuration of measuring system? Explain with any one example. **[8]**

Q9) a) Describe with neat sketches Bourdon tube type pressure gauge. Write advantages and disadvantages. **[10]**

b) Explain with neat sketch construction and working of Mclead gauge. **[8]**

OR

Q10) a) What is thermocouple? Describe the Law's of thermocouple. **[10]**

b) Describe with neat sketch construction and working of Rotameter. **[8]**

Q11) a) What are the methods of force measurement? Explain any one in detail. **[8]**

b) Explain with neat sketch construction and working of Pony break. **[8]**

OR

Q12) a) What are types of strain gauges? Explain electric resistance strain gauge. **[8]**

b) Describe with neat sketch Dead Weight tester. **[8]**

Total No. of Questions : 12]

SEAT No. :

P1070

[Total No. of Pages : 4

[4163] - 232

T.E. (Production & Industrial Engineering)

KINEMATICS OF MANUFACTURING MACHINES

(2008 Pattern) (Sem. - I)

Time :4 Hours] *[Max. Marks :100*

Instructions to the candidates:-

1) ***Attempt question 1 or 2, question 3 or 4, and question 5 or 6 from Section I.***
2) ***Attempt question 7 or 8; question 9 or 10, and question 11 or 12 from Section II.***
3) ***Assume suitable data, if required.***
4) ***State assumptions clearly.***

SECTION - I

Unit - I

Q1) a) Illustrate the elementary and complex mechanism in view to machine tool structure with examples. **[6]**

b) Design a four-link mechanism to co-ordinate three positions of the input and output links as follow: **[10]**

$\theta_1 = 20^o$, $\phi_1 = 35^o$

$\theta_2 = 35^o$, $\phi_2 = 45^o$

$\theta_3 = 50^o$, $\phi_3 = 60^o$

Q2) a) Discuss coupler curve for slider crank mechanism. **[5]**

b) Explain the kinematic structure for hobbing machine. **[5]**

c) Discuss Block synthesis. **[6]**

Unit - II

Q3) a) Discuss law of gearing. Derive necessary equation. **[8]**

b) An epicyclic gear train consists of an arm and two gears A and B having 30 and 40 teeth respectively. The Gear A is at one end of arm and gear B is at other end of the arm. The arm rotates about the center of the gear A at a speed of 80 rpm counterclockwise. Determine the speed of gear B if:

i) The gear A is fixed., and **[4]**

ii) The gear A revolves at 240 rpm clockwise instead of being free. **[4]**

P.T.O.

Q4) a) Discuss any ONE: **[6]**

i) Torques in Epicyclical Gear Train.

ii) Automotive Differential.

b) Two gear wheels mesh externally and are to give a velocity ratio of 3 to 1. The teeth are involute form; module = 6mm, addendum = one module, pressure angle = 20º. The pinion rotates at 90 r.p.m.

Determine:

i) Number of teeth on pinion to avoid interference. **[3]**

ii) Radius of addendum circle for pinion and wheel. **[2]**

iii) Path of approach, recess and length of path of contact. **[2]**

iv) Length of arc of contact. **[1]**

v) Number of pair of teeth in contact. **[1]**

vi) Maximum velocity of sliding. **[1]**

Unit - III

Q5) a) Discuss Turning Moment diagram for I.C. engines. **[4]**

b) TM diagram for multi-cylinder engine has been drawn to scale of 1 mm to 500 N.m torque and 1 mm to 6º of crank displacement. The intercepted areas between output torque curve and mean resisting torque taken in order from one end, in square mm are:

–30, + 410, –280, + 320, –330, + 250, –360, + 280, –260 mm^2 when the engine is running at 800 r.p.m. Fluctuation of the speed is not to exceed 2% of the mean speed. Assume safe centrifugal stress as 7 MPa; The density of flywheel material as 7200 kg/m^3 and the width of flywheel rim as 5 times the thickness. Find:

i) Mean angular speed. **[2]**

ii) The value of 1 mm^2 area in work units. **[1]**

iii) Sketch TM diagram. **[2]**

iv) Fluctuation of energy. **[3]**

v) Mean diameter of the rim. **[3]**

vi) Width and thickness of rim. **[3]**

Q6) a) Derive the expression for limiting velocity in flywheel rim. **[4]**

b) The torque delivered by the two stroke engine is represented by

T = (1200 + 1400 sin + 210 sin 2 + 21 sin 3) N.m.

Where is the angle turned by crank from the inner dead center. The engine speed is 210 r.p.m. Assume radius of gyration for flywheel as 800 mm and maximum fluctuation of the speed not to exceed $\pm$ 1.5% of the mean speed.

Determine:

i) Power of the engine **[4]**

ii) Maximum fluctuation of energy. **[5]**

iii) Mass of the flywheel required. **[5]**

SECTION - II

Unit - IV

Q7) a) Discuss classification of cams according to shape. **[6]**

b) Draw the profile of the cam operating a roller reciprocating follower and with the following data. **[12]**

Minimum radius of the cam = 25 mm

Lift = 30 mm

The cam lifts the follower for 120º with **SHM** followed by a **dwell** period of 30º. Then the follower lowers down during 150º of the cam rotation with **uniform acceleration and deceleration** followed by a dwell period. Design the cam. If the cam rotates at a uniform speed of 150 rpm, calculate the maximum velocity and acceleration of the follower during the decent period.

Q8) a) Explain constant acceleration motion of followers with neat sketches.**[4]**

b) Draw the profile of a cam operating a knife-edge follower having the lift of 30mm. The cam raises the follower with SHM for 150º of the rotation followed by a period of dwell for 60º. The follower descends for the next 100º rotation of the cam with uniform velocity, again followed by a dwell period. The cam rotates at a uniform velocity of 120 rpm and a least radius of 20 mm. Design the cam. What will be the maximum velocity and acceleration of the follower during the lift and return? **[14]**

Unit - V

Q9) a) Discuss tractive force and derive the necessary expression for maximum variation in tractive force. **[6]**

b) Four masses A, B, C and D are completely balanced. Masses C and D make angles of 90° and 195° respectively with that of the mass B in CCW. The rotating masses have following property: **[10]**

M_b = 25 kg, M_c = 4025 kg, M_d = 325 kg,

R_a = 150 mm, R_b = 200 mm, R_c = 100 mm, R_d = 180 mm.

Plane B and C are 250 mm apart. Determine:

i) The mass A and its angular position with respect to mass B.

ii) The position of all the planes relative to plane of mass A.

Q10)a) Discuss Static and Dynamic balancing. **[5]**

b) Is it possible to balance a reciprocating mass completely? Discuss. **[5]**

c) Explain how balancing of several masses in different planes is done. **[6]**

Unit - VI

Q11)a) Derive the expression for motion of longitudinal free vibration (by any one method) **[6]**

b) Spring stiffness is 15 kN/m. A mass of 25 kg vibrates with a damper. The damping provided is only 15% of critical value. Determine:

i) The critical damping coefficient. **[2]**

ii) The damping factor. **[2]**

iii) The natural frequency of damped vibrations. **[2]**

iv) The logarithmic decrement. **[2]**

v) The ratio of two consecutive amplitudes. **[2]**

Q12)a) Discuss: whirling of shafts. **[5]**

b) What are transverse vibrations? Derive empirical formula of Dunkerley. **[5]**

c) How moment of inertia of unsymmetrical castings is determined? **[6]**

Total No. of Questions : 12] **SEAT No. :**

P1071 **[Total No. of Pages : 3**

[4163] - 233

T.E. (Production Engg.)

MATERIAL FORMING

(2008 Pattern) (Semester - I)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:-

1) ***Answer any 3 questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain various factors affecting plastic deformation. **[8]**

b) Derive and state the relationship between: **[8]**

i) Linear Strain and natural strain.

ii) Nominal stress and true stress.

OR

Q2) a) A bar of 100 mm initial length is elongated to a length of 200mm by the forming process in three stages. The increase in length in each stage is given below: **[8]**

Stage 1 : 100mm length increased to 150 mm.

Stage 2 : 150mm length increased to 180 mm.

Stage 3 : 180mm length increased to 200 mm.

i) Calculate engineering strain (e) and true strain (E) for each stage. Also calculate overall engineering strain and overall true strain.

ii) Show why true strains are more convenient than that of engineering strain.

b) What is formability? How to draw forming limit diagram. (FLD)? **[8]**

P.T.O.

Q3) a) Explain the working, construction and applications of forging machines with neat sketch. **[8]**

b) Discuss various design considerations in Forging. **[8]**

OR

Q4) a) Compare press forging over drop forging. **[6]**

b) A 200mm wide, 500mm long and 20mm thick strip is compressed between two flat dies in plain strain such that the dimension 500 remains constant. The coefficient of friction between the dies and the strip is 0.1, and yield strength of the material in compression is 200 N/mm^2. Determine the mean die pressure and maximum die pressure. Also determine the change in mean and maximum pressure when coefficient of friction is changed to its half. **[10]**

Q5) a) In wire drawing operation, show that the drawing stress is given by the equation, **[12]**

$$\sigma_d = \quad _o \qquad [1 - (1 - R_A)^B]$$

where, B = . cot , = coeff of friction, and

= semi-die angle.

R_A = Reduction in Area $\frac{(1 + B)}{B}$

$_o$ = Yield stress

$_d$ = drawing stress.

b) Explain lubrication process used in tube drawing operation. **[6]**

OR

Q6) a) Explain stepped cone and multistage wire drawing machine with neat sketch. State their relative merits and demerits. **[9]**

b) Discuss stresses acting while drawing a tube with fixed plug, floating plug and moving mandrel, with neat sketch. **[9]**

SECTION - II

Q7) a) What is the effect of following factors on roll separating force? **[8]**

i) The coefficient of Friction, ii) Reduction

iii) Roll diameter iv) Front and Back tension.

b) Discuss various problems in Rolling. **[8]**

OR

Q8) a) How Roll flattening can be avoided? Explain. **[8]**

b) For cold rolling; show that **[8]**

R.L. = $_{o} \times W_{m} \times$,

mention the assumptions made.

Q9) a) Explain flow patterns of direct, indirect and hydrostatic extrusion. **[8]**

b) Explain, how seamless tubes are produced by extrusion process. **[8]**

OR

Q10)a) Explain the variation of extrusion pressure with ram travel in direct and indirects extrusion with proper graphs. **[8]**

b) What are the advantages and limitations of extrusion process over other metal forming processes? **[8]**

Q11)a) Discuss various methods of flow forming. **[6]**

b) Explain electromagnetic forming with neat sketch. **[6]**

c) Write a note on microforming. $\sigma\sqrt{R.\Delta h}$ **[6]**

OR

Q12)a) Write a note on petro-forge forming. **[6]**

b) Compare high velocity forming with conventional forming. **[6]**

c) Discuss tribological aspects in microforming. **[6]**

Total No. of Questions : 12]

SEAT No. :

P1072

[Total No. of Pages : 4

[4163] - 234

T.E. (Production)

PRODUCTION MANAGEMENT

(2008 Pattern) (Sem. - I)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:-

1) ***Answer any 3 questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Use of the logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Unit - I

Q1) a) Define Production, Production Management and state the objectives of Production Management. **[10]**

b) Explain the relationship of production with other functional department. **[6]**

OR

Q2) a) Production Management is concerned with the planning, organising, directing and controlling the activities of production. Comment. **[10]**

b) Explain the types of Production system. **[6]**

Unit - II

Q3) a) Compare Production Planning and Production Control. **[8]**

b) Discuss planning the production is the pre-operation activity. **[8]**

OR

Q4) a) Define PPC and state the objectives of PPC. **[8]**

b) With the help of figure explain the stages in Product Life Cycle. **[8]**

P.T.O.

Unit - III

Q5) a) Define Plant Layout. Explain the objectives of good plant layout. **[10]**

b) Consider a following assembly network relationship of a product. The number of shift per day is one and the number of the working hours per shift is 8.M/s. Techno company aims to produce 40 units of product per shift.

Operation No	Immediate Preceding Task	Duration (Min)
1	-	8
2	1	3
3	1	2
4	1	4
5	1	7
6	3, 7	4
7	2	5
8	4, 5	6
9	6	8
10	7, 8, 9	8

i) Draw the precedence diagram. **[2]**

ii) What is the desired cycle time? **[2]**

iii) What is the theoretical number of workstation? **[2]**

iv) What are the efficiency and balance delay of the solution obtained. **[2]**

OR

Q6) a) Define Material Handling System. What is the relationship between good plant Layout and Material Handling system? **[10]**

b) Explain different types of Material handling equipments with its applications. **[8]**

SECTION - II

Unit - IV

Q7) a) Define Sales forecasting. Why there is a need for sales forecasting. **[9]**

b) The demand for a product X is 1000 units & 1500 units for the month of April and May respectively. Using 2000 units as a demand for the month of April, forecast the demand for the month of June taking the value of $\alpha = 0.2$ **[9]**

OR

Q8) a) Explain with the help of figure various demand patterns used in Sales forecasting. **[9]**

b) There is a correlation between population of the city and Maruti Ritz sold. This relation is shown in the following table. **[9]**

Population in lakhs	4	7	9	12	16	19
No of Maruti Ritz sold in thousands	2	3	4	5	6	7

Estimate the sales of Maruti Ritz with population 22 and 26 lakhs.

Unit - V

Q9) a) Explain Critical Ratio scheduling in detail. **[8]**

b) There are seven jobs each of which has to go through the machines M1 and M2 in the order of M1 M2. Processing time in hours are given as:**[8]**

Jobs	1	2	3	4	5	6	7
Machine M1	4	13	16	7	11	12	10
Machine M2	9	11	11	7	13	2	4

Determine a sequence of these jobs that will minimize the total elapsed time.

OR

Q10)a) Explain Forward and Backward Scheduling. **[8]**

b) The activity details and their predecessors are given below along with their activity times. Construct the network diagram and compute the critical path. **[8]**

Activity	**Predecessors**	**Activity Time** (Weeks)
A	--	6
B	--	10
C	--	14
D	C	6
E	A, B	14
F	E, D	6
G	D	4
H	F, G	4

Unit - VI

Q11)a) Explain the basic concept of world Class Manufacturing. **[8]**

b) Explain any two advanced manufacturing philosophies. **[8]**

OR

Q12)a) Write a short note on Supply Chain Management. **[8]**

b) Explain in short Energy Conservation. **[8]**

Total No. of Questions : 12]

SEAT No. : ____

P1073

[Total No. of Pages : 4

[4163] - 235

T.E. (Production Engineering)

CUTTING TOOL ENGINEERING

(2008 Pattern) (Sem. - I)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:-

1) ***Attempt one question of each unit from section - I and Section - II.***
2) ***Answers to the questions should be written on separate books.***
3) ***Draw neat diagram wherever necessary.***
4) ***Assume suitable data, if required.***

SECTION - I

Unit - I

Q1) a) Find chip reduction coefficient, shear force, Normal force, coefficient of friction, resultant force, specific energy in friction for following data- Rake angle on tool 12 degree, feed = 0.20mm/rev, Depth of cut = 1.5mm, cutting speed 60 m/min, cutting force = 1200N, feed force = 350N, cut chip thickness = 0.5mm. **[10]**

b) What is strain in chip? Show that in an orthogonal cutting process with zero rake angle tool, shear strain is given by $e = (1 + r^2)/r$ where r = chip thickness ratio. **[10]**

OR

Q2) a) A tubing of 50mm outside diameter is turned on a lathe at a cutting speed of 25m/min and feed 0.4mm/rev, the rake angle of tool is 15 degree, The cutting force is 900 N and feed force 300N, the length of continuous chip in one revolution is 80 mm-calculate-chip thickness ratio, chip thickness, shear plane angle, coefficient of friction, velocity of chip along face, power for cutting. **[10]**

b) Write a note on orthogonal and oblique cutting. **[5]**

c) Explain why built up edge on a cutting tool is undesirable. What is the use of a chip breaker? **[5]**

P.T.O.

Unit - II

Q3) a) What are the requirements of cutting tool material? Explain different style of carbide tips. **[6]**

b) Draw the tool geometry for the following cutting tool. Show the important angles and other elements **[9]**

i) broach, ii) twist drill.

OR

Q4) a) Write note on: **[8]**

i) Clamping arrangement of insert,

ii) Types of coating and it's necessity.

b) Explain with suitable sketch the process of manufacturing HSS tool by Electro Slag Refining (ESR) process. **[7]**

Unit - III

Q5) a) For following data calculate the tool life if cutting speed, feed, depth of cut are increased only by 20% individually and also collectively at a time **[8]**

$VT^{0.15} F^{0.70} D^{0.40} = C$, V = 25m/min, F = 0.3 mm/rev, D=2mm, T=60Min

Where V = Cutting speed (m/min), F = Feed (mm/rev), D = Depth of cut (mm), T = Tool life (min)

b) Explain Taylor's tool life equation. What are different indications of tool failure. **[7]**

OR

Q6) a) What is Machinability and Machinability Index? State the factors affected on it. **[7]**

b) Write a note on:

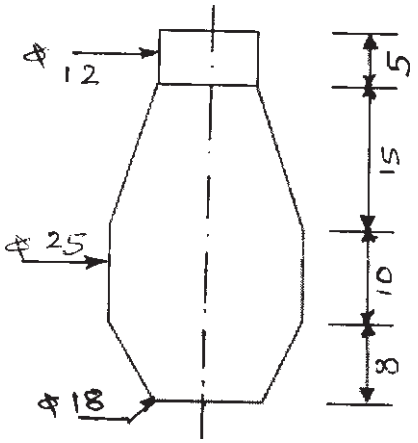
i) wear in tool, ii) Economics of machining. **[8]**

SECTION - II

Unit - IV

Q7) a) Design a circular form tool for following job **[7]**

α =Rake angle = 15°, γ =Relief angle = 10°, K = Chip disposal thickness = 5mm



b) State the design aspect of a reamer tool. **[8]**

OR

Q8) a) Design and draw a sketch for a Key-Way broach for cutting a key way of size 4mm wide and 5mm in depth a work piece having a hole prior to broaching of size 30 mm in diameter and in length 50mm Determine pitch of teeth, length of cutting portion, number of cutting teeth contact at a time and force required to pull broach through work. Given Rise/ tooth = 0.015mm, Number of finishing teeth = 3, force to remove / mm^2 of metal is 3000N. Also sketch the broach of your design and show dimension on it. **[9]**

b) Calculate the cross section of a single point turning tool made of HSS. Data given are as follows: Allowable stress HSS = 250 Mpa, Young's modulus of HSS = 2×10^6 MPa, Main cutting force = 1400N, Permissible deflection of tool tip = 0.05mm. Also draw geometry of the tool by assuming suitable angle. **[6]**

Unit - V

Q9) a) Compare with neat sketch leaf jig and box jig. **[5]**

b) Explain different method for indexing the job in Jig. **[5]**

c) Write note no different types of locating pin. **[5]**

OR

Q10)a) Differentiate between jig and fixture. **[5]**

b) Write a note on **[10]**

i) quick acting clamping device,

ii) Economic of Jig and fixture.

Unit - VI

Q11) Design a jig for drilling 12 mm holes for a component shown in fig. no.2. **[20]**

OR

Q12) Design a boring fixture to counter bore of size 30mm × 6mm depth shown in fig. no.2. Draw minimum two views of your design, show the component in position, name all important elements in drawing, write a part list of your design and draw detail view for locating, clamping, and bushing.

[20]

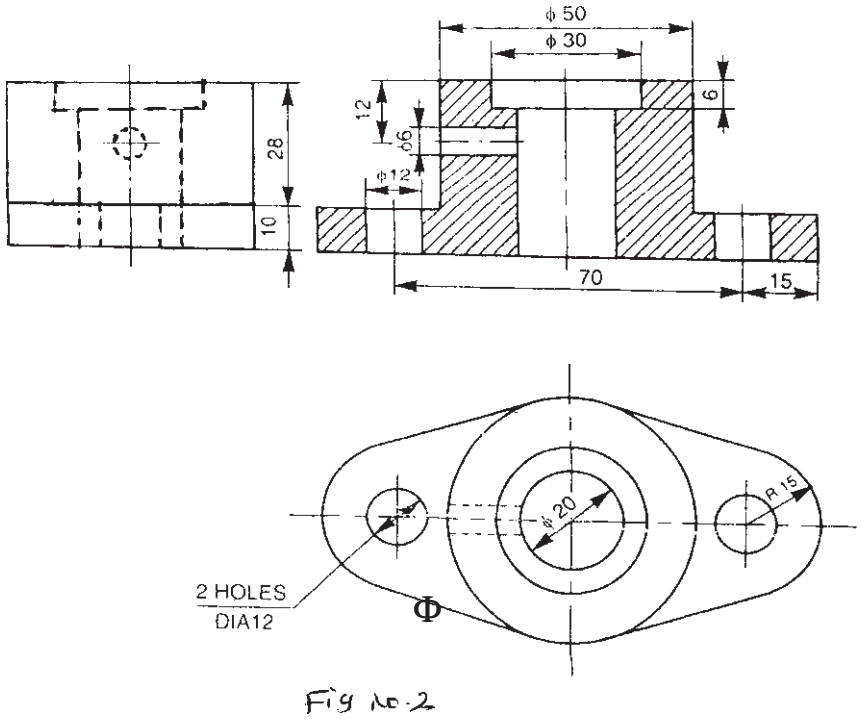


Fig No.2

Total No. of Questions : 12]

SEAT No. : ____

P1074

[Total No. of Pages : 3

[4163] - 236

T.E. (Production)

MACHINE TOOL ENGINEERING

(2008 Pattern) (Sem. - II)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:-

1) ***Attempt one question from each unit in section I and Section II.***
2) ***Answer to the sections should be written on separate answer books.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary.***

SECTION - I

Unit - I

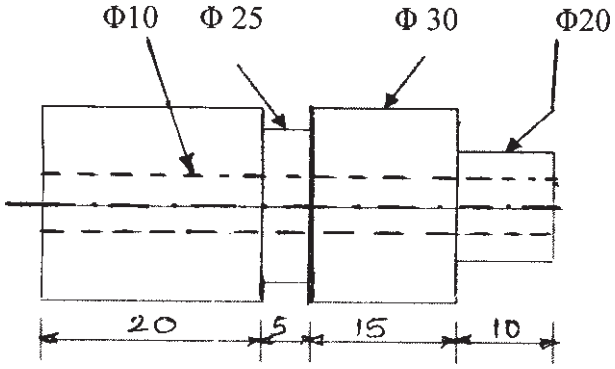
Q1) Design and draw cam profile for the component shown in figure below. Also work out the following requirements. **[20]**

a) Sequence of Operation

b) Table for cam angle and cycle time

c) Cam profile for turret operation.

Data Given-Cutting speed - 35M/min, Feed 0.2 mm/rev, Work piece - MS



OR

Q2) a) Explain in brief In-line transfer and Drum type transfer machine. **[8]**

b) Discuss steps for cam design. **[6]**

c) What are the different type of automatic machine? Write comparison between turret and capstan with figure. **[6]**

P.T.O.

Unit - II

Q3) a) What is a NC Machine tool system? What are its main elements? Describe each element in brief. **[8]**

b) What is a machining center? Explain any on machining center and write the characteristics of machining center. **[7]**

OR

Q4) a) What do you mean by "Direct Numerical Control" (DNC)? Explain briefly. State its advantages and disadvantages also. **[7]**

b) Write down use of G and M code in CNC. Write down the meaning. **[8]**

N001 G00 X25 Z30 S3000 F0.5 T0102 M04

N002 G02 X–20 Z – 20 R5 S1100 F0.5 M30.

Unit - III

Q5) a) The system is capable of making 55 delivers/hr. The following specifies the performance characteristics of the system. **[7]**

Average distance travelled/delivery	=	150m
Vehicle velocity	=	50 m/min
Pick up time	=	50 Sec
Drop off time	=	50 Sec
Average distance traveling empty	=	100 m
Traffic factor	=	0.85

Determine the number of vehicles required to satisfy the delivery demand. Also determine the handling system efficiency.

b) Explain with neat sketch any one type of machine vision system. What are its advantages. **[8]**

OR

Q6) a) What are the objectives of Automated storage system. **[4]**

b) Explain in briefly types of Automated storage/retrieval systems. **[6]**

c) Explain briefly how you can achieve vehicle guidance, routing and traffic control in a manufacturing plant employing AGVs. **[5]**

SECTION - II

Unit - IV

Q7) a) Explain different process parameters affect on MRR in USM. **[8]**

b) Write a short note on: **[10]**

i) Chemical machining ii) abrasive jet machining.

OR

Q8) a) What is laser beam machining? Explain its principle of operation. **[6]**

b) Explain with a neat sketch the working principle of Plasma arc machining. **[6]**

c) Discuss with block diagram wire cut EDM. **[6]**

Unit - V

Q9) a) How control systems are classified? Explain adaptive control system used in machine tool. **[8]**

b) Describe the operation involved in preparing a Machine tool foundation. **[8]**

OR

Q10) a) Discuss different types of coolant used in machine tool and their selection. **[8]**

b) Discuss about evaluating machine tool reliability. **[8]**

Unit - VI

Q11) a) Explain schematically the set up of a hobbing machine for cutting a spur gear. **[8]**

b) Explain in detail different gear cutting process. **[8]**

OR

Q12) a) Describe the method of Gear teeth forming with the help of an end mill cutter. **[6]**

b) Give the comparison of gear hobbing and Gear shaping. **[5]**

c) How bevel gears cut? Explain briefly. **[5]**

Total No. of Questions : 12] **SEAT No. :**

P1075 **[Total No. of Pages : 4**

[4163] - 238

T.E. (Production)

INDUSTRIAL ENGINEERING AND QUALITY ASSURANCE

(2008 Pattern) (Sem. - II)

Time :3 Hours] ***[Max. Marks :100***

Instructions to candidates:-

1) ***Answer any 3 questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Unit - I

Q1) a) Define Industrial Engineering. Explain the history in the development of Industrial Engineering. **[8]**

b) Define productivity. Explain various ways to increase the productivity of manpower and material. **[8]**

OR

Q2) a) Explain briefly the following tools and techniques of Industrial Engineering. **[8]**

i) Plant layout. ii) Value analysis.

b) Define productivity. "Increase in productivity leads to increase in standard of living". Justify. **[8]**

Unit - II

Q3) a) Define Micro motion studies. State the objectives. Explain Therbligs.**[10]**

b) Explain and construct Man-Machine chart for the operator working on photo copy machine with suitable format. **[8]**

OR

P.T.O.

Q4) a) Explain and construct Multiple activity chart with suitable example. **[8]**

b) Explain the following:

i) String diagram. **[5]**

ii) Travel chart. **[5]**

Unit - III

Q5) a) Explain the procedure to carry out work sampling study and to calculate standard time for the job. **[8]**

b) The following elemental data is recorded in minutes for calculation of the standard time of the job. **[8]**

Element number	Observed time(min.)	Frequency	Rating (%)
1	3	1	110
2	2.1	1	100
3	5	1/10	115
4	1.9	1	95
5	10	1/5	110
6	3.4	1	MACHINE ELEMENT
7	1.6	1	110

Calculate the basic time and the standard time for the job considering the relaxation allowance as 10% and the contingency allowance as 2%.

OR

Q6) a) Explain the procedure to carry out stop watch time study to calculate standard time for the job. **[8]**

b) Explain the following

i) Westing house system of rating. **[4]**

ii) Contingency allowance. **[4]**

SECTION - II

Unit - IV

Q7) a) State in brief characteristics of quality and explain Juran's contribution in quality control. **[8]**

b) Write short note on acceptance sampling. **[10]**

An analyst takes 20 samples of size 200 each from output of a final assembly line. The items in each sample are inspected and no.of defectives in each sample are recorded. The results are given in the table below:

Sample No.	1	2	3	4	5	6	7	8	9	10
No. of defectives9	9	7	14	15	8	7	9	11	16	12
Sample No.	11	12	13	14	15	16	17	18	19	20
No. of defectives	26	18	11	8	10	10	15	13	9	12

Calculate average fraction defectives and control limits for fraction defectives. Suppose that sometime after the chart has been established a sample of 300 items is taken and found to contain 25 defectives. Does time result will suggest a satisfactory population mean is being maintained?

OR

Q8) a) What is importance of OC curve? How it is useful in preparing various sampling plans? **[8]**

b) A Sub Group of 5 items each are taken from a manufacturing process at regular intervals. A certain Quality characteristics is measured and X bar and R values are computed. After N = 25 subgroups, it is found that: Σ X bar = 357.50 and R = 8.80. If the specification limits are 14.40 $\pm$ 0.40, compute the process capability. **[10]**

Unit - V

Q9) a) Explain TQM process and PDCA cycle. **[8]**

b) Draw the failure rate curve for industrial product and explain its shape. Assume that a product has a constant failure rate of = 0.001 per hour. Find out the reliability of the product at 1000 hours and 10,000 hours. **[8]**

OR

Q10) a) Explain with suitable example any one Statistical Quality control tool in detail. **[8]**

b) Describe the various approaches available to increase the reliability of

i) Single component system

ii) Multiple component complex system.

It is desired to have a reliability of at least 0.990 for a specified service period of 8,000 hours on the assumption of a uniform failure rate, what is the least value of ' that will yield this desired reliability? **[8]**

Unit - VI

Q11)a) Discuss the difference between ISO 9001:2000 and ISO9001:2008 standards. **[8]**

b) Design a system for a small scale industry manufacturing precision automobile components. **[8]**

like shafts, pins etc. to meet the requirements as per ISO 9000.

OR

Q12)a) Discuss briefly: **[8]**

i) TS 16949 standards

ii) Deming Prize

iii) Rajiv Gandhi Quality Award.

b) Using the building where you study, determine the environmental aspects and impacts. Establish hypothetical objectives and targets. **[8]**

Total No. of Questions : 12] **SEAT No. :**

P1076 **[Total No. of Pages : 3**

[4163] - 240

T.E. (Production Engg.)

PRODUCTION METALLURGY

(Common to Production S/W) (2008 Pattern) (Sem. - II)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:-

1) ***Answer Q1 or Q2, Q3 or Q4, Q5 or Q6 from Section I and Q7 or Q8, Q9 or Q10, Q11 or Q12 from Section II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Draw neat Fe-Fe_3C equilibrium diagram. Mention all the phases, important temperatures on it. Calculate amounts of phases that are obtainable at room temperature if AISI 1060 steel is cooled under equilibrium cooling condition. Also define phases present in AISI 1060 at room temperature. **[8]**

b) Explain resolving power, total magnification, numerical aperture and bright field illumination. **[4]**

c) Define:- δ Ferrite, Cementite, Ledeburite and Austenitee. **[4]**

d) Explain the advantages of Electrolytic polishing with suitable examples. **[2]**

OR

Q2) a) Explain with composition:- FeE270, AISI050, 60C10, En31, 80T11 and T85W6Mo5Cr4V2 **[6]**

b) Widmanstatten structures is not preferred in hypoeutectoid justify & suggest suitable remedies for the same and hypereutectoid steels. **[4]**

c) Explain Mounting and Etching. **[4]**

d) Explain in brief the classification of steels with suitable examples. **[4]**

P.T.O.

Q3) a) Draw the TTT diagram for eutectoid steel or AISI 1080 steel. **[4]**

b) What is hardenability? Explain the factors influencing hardenability? **[4]**

c) What is Retained Austenite (R.A.) and How can it be eliminated? **[4]**

d) Define Bainite. Why bainite is not present in CCT diagram? **[4]**

OR

Q4) a) Show following heat treatments on Iron-Carbon equilibrium diagram: Different types of Annealing and Normalising. **[4]**

b) Explain secondary hardening and temper embrittlement. **[4]**

c) Why tempering is done? With a suitable graph, explain the changes in properties that take place during tempering. **[6]**

d) Draw microstructures of

i) C40

ii) Slowly cooled 1.2%C steel. **[2]**

Q5) a) Distinguish between **[8]**

i) Nitriding and Carbonitriding.

ii) Induction hardening and Flame hardening.

b) Explain Patenting in brief. **[4]**

c) Compare Pack carburizing with Liquid carburizing. **[4]**

OR

Q6) a) Distinguish between Austempering and Ausforming. **[4]**

b) Explain Martempering in brief. **[4]**

c) Is heat treatment required after nitriding. Explain. **[4]**

d) Why it is necessary to do heat treatment of carburized parts explain with suitable example. **[4]**

SECTION - II

Q7) a) Which alloy steels would you suggest for the following applications and justify: Milling cutters, Die casting dies for Aluminium alloys, Plastic moulding dies, Master gauges, Surgical instruments, and Wrist watches. **[6]**

b) What are the effects of Chromium (Cr), Tungsten (W), Vanadium (V) and Manganese (Mn) on properties of steel. **[4]**

c) What is weld decay and sensitization and how is it eliminated? **[4]**

d) Draw microstructures of Malleable Cast Iron and Nodular S.G.Iron. **[2]**

OR

Q8) a) Explain heat treatment of HSS. **[4]**

b) Explain different types of stainless steels? **[6]**

c) Write short note on Grey Cast Iron and Alloy Cast Irons. **[6]**

Q9) a) What is equivalent zinc? Explain with an example? **[4]**

b) Give typical composition and uses for the following:
Babbits, Gun metal, Invar, Y alloy, Alnico, Cartridge brass. **[6]**

c) What are the requirements of bearing materials? With a suitable example explain hwo they are fulfilled? **[6]**

OR

Q10)a) What is season cracking of brasses? How is it eliminated? **[4]**

b) Give typical composition and uses for the following:
Monel, Muntz metal, Bell Metal, LM13, Tinman's solder, Stellites. **[6]**

c) What is modification treatment in Al alloys? **[4]**

d) What is dezincification? **[2]**

Q11)a) Composite is one of the strengthening mechanism? **[4]**

b) How are reinforced composites produced? **[4]**

c) Explain hand lay-up and filament winding process. **[6]**

d) What are the types of Metal matrix composites? Give typical uses. **[4]**

OR

Q12)a) What are biocompatible materials? Give some examples. **[4]**

b) Write a short note on **[6]**
i) Applications of Nanomaterials
ii) Sports materials.

c) Write advantages & disadvantages of composite materials. **[4]**

d) Calculate the density of Cermet based on a titanium matrix if the composite contains 50 weight % tungsten carbide, 22 weight % of tantalum carbide and 14 weight % titanium carbide.
Given that density of tungsten carbide = 15.77gm/cc, density of titanium carbide = 4.94gm/cc, density of tantalum carbide = 14.0gm/cc. **[4]**

Total No. of Questions : 12]

SEAT No. : ____

P1077

[Total No. of Pages : 7

[4163] - 242

T.E. (Production S/W)

KINEMATICS DESIGN OF MACHINES

(2008 Pattern) (Sem. - II)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Solve Que. No.1 or Que. No.2, Que. No.3 or Que. No.4, Que. No.5 or Que No.6 from Section - I and Que. No. 7 or Que. No.8, Que. No. 9 or Que. No. 10, Que No. 11 or Que. No. 12. From Section - II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***
6) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***

SECTION - I

Unit - I

Q1) a) Write the kinematic balance equation for: **[6]**

i) Screw and nut mechanism.

ii) Rack & pinion.

iii) Worm & worm wheel.

b) Explain with neat sketch the kinematic analysis of gear shaping machine. **[10]**

OR

Q2) a) Synthesize a four bar mechanism to generate a function $y = x^3 + 3x$ for $1 \leq x \leq 5$ at three precision points. Assume initial crank angle as 30^o with an interval of 90^o and initial rocker arm angle 40^o with an interval of 60^o. Assume length of fixed link as 50mm. **[8]**

P.T.O.

b) Explain following kinematic chain representation with figure. **[8]**

i) E-22 ii) C-13

iii) K-25 iv) C-12

Unit - II

Q3) a) A machine component is subjected to two dimensional stresses. The tensile stress in X-direction varies from 40 to 110 MPa while stress in Y-direction varies from 30MPa compressive to 100 MPa tensile. The corrected endurance limit of the component is 270 MPa. Determine the factor of safety. **[8]**

b) A plate is made up of plain carbon steel 40C8 (Sut = 580N/mm^2) as shown in figure, subjected to variable load of 30 kN compressive to 50kN tensile. The theoretical stress concentration factor at the change in cross section is 2.27 and notch sensitivity is 0.8. The expected reliability is 90% If the required factor of safety is 2.0 Determine the plate thickness.

Assume following data:

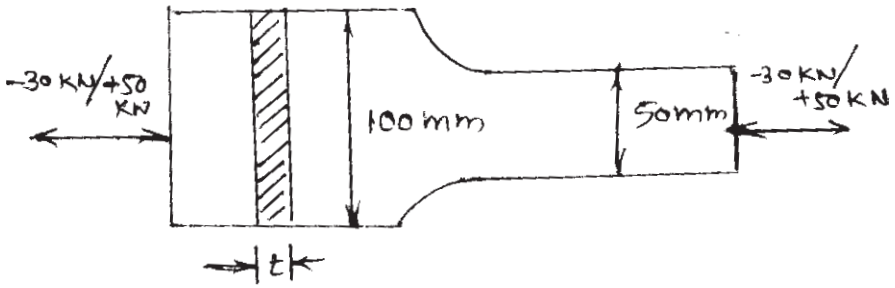
Surface finish factor = 0.75

Size factor = 0.85

Load factor = 0.923

Reliability factor = 0.897

Figure: **[8]**



OR

Q4) a) A transmission shaft supports a pulley midway between the two bearings. The bending moment at the midpoint varies from 200Nm to 500Nm. The torque on the shaft varies from 70Nm to 180Nm. The frequencies of variation of bending and torque are equal to the shaft speed. The shaft rotates at 1440 rpm. The shaft is made of alloy steel having ultimate tensile strength of 700N/mm^2 & yield strength of 550N/mm^2. The corrected endurance limit of the shaft is 220N/mm^2 If the factor of safety is 2.0. Determine the diameter of the shaft. **[10]**

b) Define following terms: **[6]**

i) Fatigue. ii) Endurance limit.

iii) Stress concentration.

Unit - III

Q5) a) In which applications the spur gears are preferred over the helical gears? Why? **[4]**

b) Explain the force analysis of helical gear with neat sketch. **[3]**

c) A spur pinion having 21 teeth to be made of alloy steel (Sut = 800N/mm^2) is to mesh with a gear to be made of plain carbon steel (Sut = 720 N/mm^2) the gear pair is required to transmit 8 kw power from an electric motor running at 1000 rpm to a machine running at 300 rpm. The starting torque of the motor is 150% of the rated torque. The factor of safety required is 2.0 The gear and pinion are to be case hardened to 300BHN & 350BHN respectively. Design the gear pair. The gears are machined to meet the specification of grade 7.

Use following data:

Face width = 10 module

$$Kv = \frac{5.6}{5.6 + \sqrt{V}}$$, Lewis Factor $Y = 0.484 - \frac{2.87}{Z}$

For grade 7, $e = 11.0 + 0.9 \left\lfloor m + 0.25\sqrt{d} \right\rfloor$,

Dynamic Load $Fd = \frac{e.np.zp.b.rp.rg}{2527\sqrt{rp^2 + rg^2}} \cos\phi$ **[11]**

OR

Q6) a) A pair of helical gears consists of 20 teeth pinion meshing with 100 teeth gear. The pinion rotates at 720 rpm. The normal pressure angle is 20º while the helix angle is 25º. The face width is 40mm and the normal module is 4mm. The pinion as well as gear are made of steel having ultimate tensile strength of 600Mpa & hear treated to a surface hardness of 300BHN. The service factor & factor of safety are 1.5 & 2.0 respectively. Calculate;

i) Beam strength.

ii) Wear strength.

iii) Dynamic load by spott's equation.

iv) Maximum static load the gear can transmit &

v) Power transmitting capacity.

Lewis Equation Y' = $0.484 - \frac{2.87}{Z'}$.

For grade 8, $e = 16.0 + 1.25 \left\lfloor m_n + 0.25\sqrt{d} \right\rfloor$ **[10]**

b) State the difference between scoring & pitting of gear teeth? **[4]**

c) What is the significance of formative number of teeth in the design of helical gear? **[4]**

SECTION - II

Unit - IV

Q7) a) A shaft rotating at constant speed of 1500 rpm is subjected to variable load. The bearings supporting the shaft are subjected to a stationary equivalent radial load of 4kN for 10% of time, 2kN for 30% of time, 3kN for 40% of time and no load for remaining cycle. If the total life expected for the bearings is 30×10^6 revolutions at 95% reliability. Calculate the dynamic load rating of the ball bearings when the bearings are selected from manufactuyrers catalogue which lists 'C' at 90% reliability. **[7]**

b) Give detailed classification of bearings? **[3]**

c) Explain the following bearings in short with neat sketches: **[8]**

i) Angulaar contact ball bearing.

ii) Spherical roller bearing.

iii) Self aligning radial bearing.

iv) Taper roller bearing.

OR

Q8) a) A single row deep groove ball bearing no.6002 is subjected to an axial thrust of 1200N and radial load of 2300N. Find the expected life that 50% of the bearings will complete under this condition.
Use following data:
For 6002 Bearing Co = 2500N & C = 5590N
Values of X & Y for radial deep groove ball bearing.

Fa/Co	Fa/Fr≤ e		Fa/Fr>e		e
	X	Y	X	Y	
0.070	1	0	0.56	1.6	0.27
0.130	1	0	0.56	1.4	0.31
0.250	1	0	0.56	1.2	0.37
0.500	1	0	0.56	1.0	0.44

Interpolate for in between values. **[6]**

b) Explain the following terms as applied to journal bearings. **[6]**

i) Bearing characteristic number.

ii) Bearing modulus

c) What are the additives? Explain the different types of additives used in lubricating oils. (any four) **[6]**

Unit - V

Q9) A cast iron flywheel used for a four stroke I.C. engine developing 180 kw at 240 rpm. The hoop stress developed in the flywheel is 5.2 Mpa. The total fluctuation of speed is to be limites to 3% of the mean speed. The work done during the power stroke is 1/3 more than the average work done during the whole cycle. The maximum torque on the shaft is twice the mean torque. The density of cast iron is 7220 kg/m^3. Determine **[16]**

a) Diameter of flywheel rim.

b) Mass of the flywheel rim.

OR

Q10)a) Show that maximum fluctuation of energy in flywheel is given by

$$\Delta E = mR^2 \omega^2 C_s$$

(notations have usual meaning) **[6]**

b) Explain the working of flywheel in four stroke internal combustion engine. **[4]**

c) Explain the different types of stresses induced in. **[6]**

i) Flywheel rim.

ii) Flywheel arm.

Unit - VI

Q11)a) In a shaft and hole assembly of nominal diameter 56mm, the total tolerance on shaft diameter is $0.001\sqrt[3]{d}$ mm, while the tolerance on hole diameter is $0.002\sqrt[3]{d}$ mm, The shaft and hole diameters are normally distributed. The minimum shaft and minimum hole diameters are equal. Determine the percentage of assemblies where interference is likely to occur. The areas below the standard normal distribution curve are as follows:

Z	1.0	1.1	1.2	1.3	1.4	1.5	1.6
Area	0.3413	0.3643	0.3849	0.4032	0.4192	0.4332	0.4462

Use linear interpolation for values in between. **[10]**

b) Explain the following terms used in Johnson's method of optimum design: **[6]**

i) Primary design equation.

ii) Subsidiary design equation.

iii) Material parameters.

iv) Geometrical parameters.

OR

Q12)a) The breaking capacities of the batch of two hundred wires are tabulated as follows. **[8]**

Breaking Capacity N	Number of wires
260-280	4
280-300	24
300-320	100
320-340	64
340-360	8

The designer has specified 270 N and 350N as lower and upper limits respectively for the breaking capacity of wires. Determine the percentage of wires likely to be rejected.

The areas below the standard normal distribution curve are as follows:

Z	2.0	2.1	2.2	2.3	2.4	2.5
Area	0.4772	0.4821	0.4861	0.4893	0.4918	0.4938
Z	2.6	2.7	2.8	2.9	3.0	3.1
Area	0.4953	0.4965	0.4974	0.4981	0.4987	0.4990

Use linear interpolation for values in between.

b) Explain the difference between 'design tolerance' and 'natural tolerance'. How the designer would select the tolerances for the minimum rejection of the components? **[4]**

c) What is the 'adequate design' and 'optimum design'? Explain with suitable example. **[4]**

Total No. of Questions : 12] **SEAT No. :**

P1078 **[Total No. of Pages : 2**

[4163] - 244

T.E. (Production Sandwich)

PRODUCTION & INDUSTRIAL MANAGEMENT - II

(2008 Pattern) (Sem. - II)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:-

1) ***Answer Q1 or Q2, Q3 or Q4, Q5 or Q6 from Section I, Q7 or Q8, Q9 or Q10, Q11 or Q12 from Section II.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Figures to the right indicate full marks.***
4) ***Neat diagrams must be drawn wherever necessary.***
5) ***Assume suitable data, if necessary.***
6) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***

SECTION - I

Unit - I

Q1) a) Explain theory of Supply and Demand. **[6]**

b) Explain the functions of Money. **[8]**

c) Explain the concept of equilibrium in supply and demand. **[4]**

OR

Q2) a) Explain the difference between Marketing and Selling concept. **[8]**

b) What are the objectives of Material Management? **[6]**

c) Explain ABC Analysis. **[4]**

Unit - II

Q3) a) Explain the phases of process planning. **[8]**

b) Explain the functions of process Engineering. **[8]**

OR

Q4) a) Discuss time estimate and time standard. **[8]**

b) What are the different factors affecting process design. **[8]**

Unit - III

Q5) a) What are the different methods use for measurement and compare the surface roughness? **[8]**

b) Discuss Standard tooling and Special tooling. **[8]**

OR

P.T.O.

Q6) a) Explain in brief Basic manufacturing processes. **[10]**

b) Define following with the help of diagram. **[6]**

i) Flatness ii) Roundness iii) Symmetry

SECTION - II

Unit - IV

Q7) a) Explain AOQ and LTPD. **[8]**

b) Explain single and double sampling plan. **[8]**

OR

Q8) a) What are the advantages and limitations of Statistical Quality Control? **[8]**

b) Ten pieces of cloth out of different rolls of equal length contained the following numbers of defect: 1, 3, 5, 0, 6, 0, 9, 4, 4, 3

Draw a control chart for the number of defects and state whether the process is in a state of statistical control. **[8]**

Unit - V

Q9) a) Explain Deming's PDCS Cycle. **[8]**

b) What is Concurrent Engineering? **[8]**

OR

Q10)a) Explain 7QC Tools. **[12]**

b) Explain JIT. **[4]**

Unit - VI

Q11)a) Explain the concept of "Total Productive Maintenance". **[8]**

b) Explain the terms "Product" and "Service" in context with ISO 9001 Standards. **[8]**

c) Define: Fault Tree Analysis (FTA) **[2]**

OR

Q12)a) Write down the short note on Design of Experiments. **[8]**

b) Explain FMEA. **[8]**

c) What is mean by Reliability? **[2]**

Total No. of Questions : 12]

SEAT No. :

P1079

[Total No. of Pages : 2

[4163] - 251

T.E. (Electrical Engg.)

ENGINEERING ECONOMICS AND MANAGEMENT

(2008 Pattern) (Theory) (Sem. - I)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:-

1) ***Answer to the two sections should be written in separate answer books.***
2) ***Figures to the right indicate full marks.***

SECTION - I

Unit - I

Q1) Define organisation? Explain various types of Business ownerships with suitable examples. **[16]**

OR

Q2) a) Explain the concept of Elasticity of demand and Elasticity of supply with suitable examples. **[8]**

b) What is Demand forecasting? Explain various methods of demand forecasting. **[8]**

Unit - II

Q3) Define Management. Explain Meaning, Scope, Importance & functions of Management in detail. **[16]**

OR

Q4) a) Explain the concept of six sigma with example. **[8]**

b) Explain the concept of JIT in detail. **[8]**

Unit - III

Q5) a) Define Marketing. Explain '4p' of Marketing. **[9]**

b) Explain meaning, Scope & importance of Online Marketing. **[9]**

OR

Q6) a) Define Cost. Explain various types of cost with suitable example. **[9]**

b) Explain the concept of Break Even Analysis with suitable example. **[9]**

P.T.O.

SECTION - II

Unit - IV

Q7) a) Define motivation. Explain Maslow theory of Need Hierarchy. **[8]**

b) Compare and contrast 'X & Y theory' and 'Herzberg theory' of motivation. **[8]**

OR

Q8) a) Define Leadership. Explain qualities of a good leader. **[8]**

b) Explain the concept of Entrepreneurship. State various qualities of Entrepreneur. **[8]**

Unit - V

Q9) a) Define Training. Explain various methods for Training of Employees. **[8]**

b) Explain Recruitment process in detail. **[8]**

OR

Q10) Write short notes

a) Business Ethics. **[4]**

b) Job Satisfaction. **[4]**

c) Time Management. **[4]**

d) Personality development. **[4]**

Unit - VI

Q11) a) Explain meaning, scope & importance of Disaster management. **[9]**

b) Explain various types of Disaster. **[9]**

OR

Q12) a) Prepare a Disaster Management Plan for Fatal Road accident. **[9]**

b) What do you mean by Industrial Safety? Explain various safety measures. **[9]**

Total No. of Questions : 12] **SEAT No. :**

P1080 **[Total No. of Pages : 3**

[4163] - 252

T.E. (Electrical)

MICROCONTROLLER AND ITS APPLICATIONS

(2008 Pattern) (Sem. - I)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:-

1) ***Answer any 3 questions from each section.***
2) ***Answer 3 questions from section I and 3 questions from section II.***
3) ***Answers to the two sections should be written in separate answer books.***
4) ***Neat diagrams must be drawn wherever necessary.***
5) ***Figures to the right indicate full marks.***
6) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
7) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain internal RAM structure of μc 8051. **[6]**

b) Explain the use of PC, SP and DPTR. **[6]**

c) Write short notes on SFR's. **[4]**

OR

Q2) a) Draw and explain the PSW of 8051μc. **[6]**

b) Explain in detail internal & external data & program memory structure of 8051 μc. **[6]**

c) Compare microprocessor and microcontroller. **[4]**

Q3) a) Explain addressing modes of 8051μc. **[6]**

b) Write the sequence of instruction that sets carry flag. **[6]**

c) Write program to load 40H in R_6 register of Bank 3. **[4]**

OR

P.T.O.

Q4) a) Explain the following instruction. **[6]**

i) PUSH OO ii) MOVC A, @ A+DPTR

iii) JMP @ A + DPTR iv) JNB P1.3, radd

v) MOV @ Rp, # n vi) ANL A, @ Rp

b) Write a program to push R_0, R_1 & R_2 of Bank 0 onto the stack and pop them back into R_5, R_6 & R_7 of Bank 3. **[6]**

c) State the two condition under which program opcodes are fetched from external memory rather than internal memory. **[4]**

Q5) a) Explain the interrupt structure of 8051 μc. If both INT0 and INT1 in the IP $ FR are set to High. What happen if both are activated at the same time. **[8]**

b) Draw logic diagram of serial port in mode 1. **[5]**

c) Write a program to generate a square wave of 2kHz freq. Assume XTAL = 11.0592 MMZ. **[5]**

OR

Q6) Write short notes on the following: **[18]**

a) Features of I^2C modbus.

b) CAN message frame format.

c) Flex Ray protocol.

SECTION - II

Q7) a) Explain the procedure of interfacing 8051 with PC using RS232 communication protocol. **[10]**

b) Write a note on use of simulator and emulator. **[8]**

OR

Q8) a) Draw the diagram for interfacing 8 KB data ROM and 8KB of Program ROM with 8051. Use starting address as 8000H. **[10]**

b) Draw and explain the block diagram of interfacing of 8051 with 8255. **[8]**

Q9) a) Explain the procedure of interfacing 8 bit ADC with 8051. Draw the suitable diagram. **[8]**

b) Write a note on measurement of temperature using 8051. **[8]**

OR

Q10)a) Draw the typical diagram of interfacing a stepper motor with 8051 and write assembly language program to rotate the stepper motor in clockwise direction. **[8]**

b) Write a note on measurement of pressure using 8051. **[8]**

Q11)a) Explain the procedure of measurement of voltage using 8051. Draw the relevant block diagram. **[8]**

b) Explain the interfacing of 4 × 4 matrix keyboard with 8051. Draw the suitable diagram. **[8]**

OR

Q12)a) Write a note on "DC motor control using 8051". **[8]**

b) Explain the interfacing of LCD with 8051. Draw the suitable diagram. **[8]**

Total No. of Questions : 12]

SEAT No. : ____

P1081

[Total No. of Pages : 3

[4163] - 253

T.E. (Electrical)

ELECTRICAL MACHINES - II

(2008 Pattern) (Sem. - I)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:-

1) ***Answer any 3 questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) With a neat diagram explain constructional details of salient pole type alternator. **[6]**

b) A 3 phase, 8 pole, 750 rpm star connected alternator has 72 slots on armature. Each slot has 12 conductors and winding is shorted by 2 slots.Find the coil pitch factor and distribution factor for the winding. Calculate induced emf in the lines if flux per pole is 0.06 weber. **[6]**

c) What is meant by short circuit ratio in case of alternator? Elaborate its significance. **[6]**

OR

Q2) a) Compare - Direct method, emf method, MMF method of Finding regulation of alternator. **[6]**

b) Calculate percentage voltage regulation (up) of a 3 phase, 230 volt, star connected alternator operating at 0.8 p.f. lag supplying load current of 10 Amp. The opencircuit test and short circuit test data is as below. **[6]**

OC EMF	I_{SC}	Ra/ph
230 volt for If = 0.38Amp	12.5 Amp for If = 0.38 Amp	0.9 Ω

c) Derive the mathematical expression for distribution factor (kd) for an alternator. **[6]**

P.T.O.

Q3) a) Describe any two methods of making the synchronous motor self start. **[8]**

b) A salient pole alternator is operated at 0.8 p.f. It is delivering rated current at rated voltage. Resistance of armature per phase is 0.02 per unit (PU), X_d = 1.2 PU, X_q = 0.8 PU. Find direct in a quadrature axis current, load angle ( ), emf (E). **[8]**

OR

Q4) a) A 3 phase star connected, 6.6 kV synchronous motor takes 72 Amp at 0.8 p.f. leading. Resistance and reactance per phase of the motor are 0.1 and 0.9 respectively. Determine emf induced and total power input. **[8]**

b) State and elaborate the conditions that must be fulfilled for satisfactory parallel operation of two alternators. **[8]**

Q5) a) Compare three phase induction motor with threephase synchronous induction motor. **[8]**

b) With a neat diagram explain construction and working of 3 phase induction voltage regulator. **[8]**

OR

Q6) a) Why V/f ratio is to be maintained constant for speed control of induction motor? With a suitable diagram explain speed control of induction motor using rotor resistance control. **[8]**

b) Write a short note on 3phase induction generator. **[8]**

SECTION - II

Q7) a) For plain ac series motor explain - direct axis and quadrature axis fluxes and different emfs induced due to these fluxes. **[9]**

b) A universal series motor has resistance of 30 and inductance of 0.5H. When connected to 250 volt DC supply, it takes 0.8 Amp and runs at 2000rpm. Determine the speed, torque and power factor when connected to a 250 volt, 50 Hz AC supply and taking same current of 0.8 Amp. **[9]**

OR

Q8) a) With a suitable diagram explain inductively compensated and conductively compensated series motor. **[9]**

b) Describe the procedure for drawing circle diagram of plain series motor. **[9]**

Q9) a) With a suitable diagram explain construction and working of brushless dc motor. **[8]**

b) What are the effects of harmonics on performance of induction motor. State the remedies to reduce the harmonics. **[8]**

OR

Q10)a) Elaborate the concept of time and space harmonics incase of induction motors. **[8]**

b) With a neat diagram explain construction and working of linear induction motor. State its applications. **[8]**

Q11)a) Explain double field revolving theory for single phase induction motor. **[8]**

b) Explain construction and working of capacitor start single phase induction motor. Draw its torque - speed characteristics. State the applications of this motor. **[8]**

OR

Q12)a) Explain cross field theory for single phase induction motors. **[8]**

b) Explain no load and blocked rotor test performed on single phase induction motor to determine its performance characteristics. **[8]**

Total No. of Questions : 12]

SEAT No. :

P1082

[Total No. of Pages : 2

[4163] - 254

T.E. (Electrical)

POWER ELECTRONICS

(2008 Pattern) (Sem. - I)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:-

1) ***Answer any 3 questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Define and explain importance of following ratings of SCR. **[8]**

i) Holding current and Latching current.

ii) Forward and reverse blocking voltages.

iii) $\frac{dv}{dt}$ and $\frac{di}{dt}$ Rating.

iv) I^2t rating.

b) Draw and explain static V-I characteristics of SCR. **[8]**

OR

Q2) a) Explain in detail Two transistor analogy of SCR. **[8]**

b) Explain and compare R & RC firing circuit of SCR. **[8]**

Q3) a) With a neat circuit diagram and necessary waveforms explain working of single phase fully controlled bridge converter feeding RLE load. **[8]**

b) With a neat diagram and necessary waveforms explain working of single phase semi-controlled bridge converter feeding RLE load. **[8]**

OR

P.T.O.

Q4) a) With neat circuit diagram and all necessary waveforms explain the working of three phase fully controlled bridge converter feeding RLE load. **[10]**

b) Write a note on selection of transformers and semiconductor devices for converters. **[6]**

Q5) a) Explain four mode operation of TRIAC. **[10]**

b) Draw neat circuit diagram and explain how TRIAC can be used as light dimmer switch. **[8]**

OR

Q6) a) Explain static on load tap changing of transformer using a.c. regulators. Draw output voltage waveform using two stages. **[9]**

b) Explain step by step procedure of design of snubber circuit. **[9]**

SECTION - II

Q7) a) With a neat diagram explain switching action of Power MOSFET. **[8]**

b) Compare BJT, MOSFET and IGBT. **[8]**

OR

Q8) a) Draw and explain transfer characteristics and output characteristic of IGBT. What is SOA? **[8]**

b) Explain switching characteristic of MCT. **[8]**

Q9) a) Explain principle of operation of step down chopper. with neat diagrams explain TRC and CLC techniques. **[10]**

b) A step up chopper has input voltage 220V and output voltage 660V. If the off time of chopper is 100 μ s, compute pulse width of output voltage. In case pulse width is halved for constant frequency operation, find the new output voltage. **[6]**

OR

Q10)a) Explain four quadrant chopper feeding RLE load. **[8]**

b) Derive expression for output voltage of step-up chopper. **[8]**

Q11)a) Explain sinusoidal pulse width modulation used in inverters. Show four pulses per half cycle of O/P voltage. **[10]**

b) Explain operation of single phase CSI. **[8]**

OR

Q12)a) Explain working of 3-phase VSI in 180^{o} mode. Draw all waveforms and equivalent ckts. **[10]**

b) Explain working of single phase full bridge inverter. Draw all waveforms. **[8]**

Total No. of Questions : 12]

SEAT No. : ____

P1083

[Total No. of Pages : 2

[4163] - 255

T.E. (Electrical)

ELECTRICAL INSTALLATION MAINTENANCE & TESTING

(2008 Pattern) (Sem. - I)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:-

1) ***Answer 3 questions from section - I and 3 questions from section - II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) State and prove Kelvin's law for feeder design with reference to supply system. State limitations of Kelvin's law. **[8]**

b) A single phase distributor has resistance of 0.2Ω and reactance of 0.3Ω. At midpoint 'a' the current is 100A at 0.6 Lagging p.f. with respect to voltage V_a at 'a'. At far end the voltage V_b is 240 V and the current is 100A at p.f. 0.8 lagging. Find the supply voltage and phase angle between V_s and V_b. **[8]**

OR

Q2) a) Compare 3d 3wire system with 3d 4 wire overhead system for volume by conductor material required. Clearly state the assumption made. **[8]**

b) The cost per km for each of the copper conductor of a section 'a' sqcm for transmission line is Rs (2800 + 1300). The load factor of the load current is 80% and the load factor for the losses is 65%. The rate of interest and depreciation is 10% and the cost of energy is 5 paisa per kwh. Find the most economical current density for transmission line by use of Kelvin's law. Given $\rho = 1.78 \times 10^{-8}\Omega m$. **[8]**

Q3) a) Explain in detail the function of the equipments used in the substain. **[10]**

b) Explain the term: **[6]**

i) Touch potential ii) Step potential.

OR

P.T.O.

Q4) a) Explain in detail design of earthing grid of substation with reference to IEEE standard 80-2000. **[8]**

b) Classify and explain various types of substation. **[8]**

Q5) a) Explain the different maintenance strategies. **[8]**

b) Discuss planned and preventing maintenance of induction motor. **[10]**

OR

Q6) a) Explain D.C. test for measurement of insulation resistance. **[8]**

b) Define and explain w.r.t. condition monitoring. **[10]**

i) Polarization index ii) Dielectric absorption ratio

SECTION - II

Q7) a) Describe various failure modes of transformer. **[8]**

b) Explain the following in detail. **[10]**

i) Dissolved gas analysis.

ii) Degree of polymerization.

OR

Q8) a) Discuss in detail different failure modes of transformer. **[8]**

b) Explain transformer oil contamination process. Explain the filteration of transformer oil with block diagram. **[10]**

Q9) a) Describe the various failure modes of power cables. Also explain various tests conducted on power cables. **[8]**

b) Explain various abnormal conditions and causes of failure of induction motor. **[8]**

OR

Q10)a) Write a short note on: **[8]**

i) Signature analysis. ii) Thermography.

b) Explain in detail tan delta measurement. **[8]**

Q11)Write notes on

(Covering construction, working and trouble shooting) **[16]**

a) Refrigerator b) Washing Machine.

OR

Q12)Write notes

(Covering construction, working and trouble shooting) **[16]**

a) Water pump b) electric oven

Total No. of Questions : 12]

SEAT No. :

P1084

[Total No. of Pages : 4

[4163] - 256

T.E. (Electrical)

POWER SYSTEM - II

(2008 Pattern) (Sem. - II)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any 3 questions from each section.***
2) ***Answer 3 questions from section - I and 3 questions from section - II.***
3) ***Answers to the two sections should be written in separate answer books.***
4) ***Neat diagrams must be drawn wherever necessary.***
5) ***Figures to the right indicate full marks.***
6) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
7) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Derive the power flow equations for real and reactive power at receiving end. **[8]**

b) A three phase 220 kV overhead line delivers 100 MVA, and power factor of 0.8 lagging at its receiving end. The constants of line are $A = 0.98 \angle 3^{o}$ and $B = 110 \angle 75^{o}$. ohms per phase. Find **[10]**

i) Sending end voltage and power angle.
ii) Sending end active and reactive power.
iii) Line losses and VAR absorbed by the line.

OR

Q2) Write short note on (any three) **[18]**

a) Procedure of drawing circle diagram.
b) Line efficiency, regulation and compensation.
c) Surge impedance loading.
d) Complex power.

P.T.O.

Q3) a) List out the advantages and drawbacks of EHV transmission. **[8]**

b) Explain the phenomenon of corona and state the various methods to reduce it. **[8]**

OR

Q4) a) Describe the concept of corona loss in detail and explain the factors affecting it. **[8]**

b) A three phase, 50 Hz, 132 kV transmission line consists of conductors of 1.17cm diameter and are spaced equilaterally at a distance of 3 units. The line has surface irregularity factor = 0.96, The barometric pressure is 72 cm of Hg. at temperature of 20ºC. Determine fair and foul weather corona loss per km/phase. Assume that at foul weather the critical disruptive voltage drops down to 80% of the value during fair weather condition. Dielectric strength of air = 30 kV (peak)/cm. **[8]**

Q5) a) What do you understand by a per unit system applicable to power system? What are the advantages and applications of p.u. system? **[8]**

b) Two generators rated 15 MVA, 13.2 kV and 20 MVA, 13.2 kV, respectively are connected in parallel to a bus. The bus feeds two motors rated 10 MVA, 15MVA respectively. The rated voltage of motors are 12.5 kV. The reactance of each generator is 15% and that of each motor is 20% on its own rating. Assume 60 MVA, 13.8 kV, base and draw a reactance diagram. **[8]**

OR

Q6) a) What do you mean by d.c. offset current? What is the effect of the instant of short circuit on the waveform of short circuit current (consists of d.c. offset) of R-L circuit. **[8]**

b) An 11 kV generating station has four identical three phase alternators A, B, C and D each of 10 MVA capacity and 12% reactance. There are two sections P & Q linked by a reactor rated at 10 MVA with 24% reactance. The single line diagram for the system is as shown. Load is connected as shown calculate current fed into three phase S.C. fault shown. **[8]**

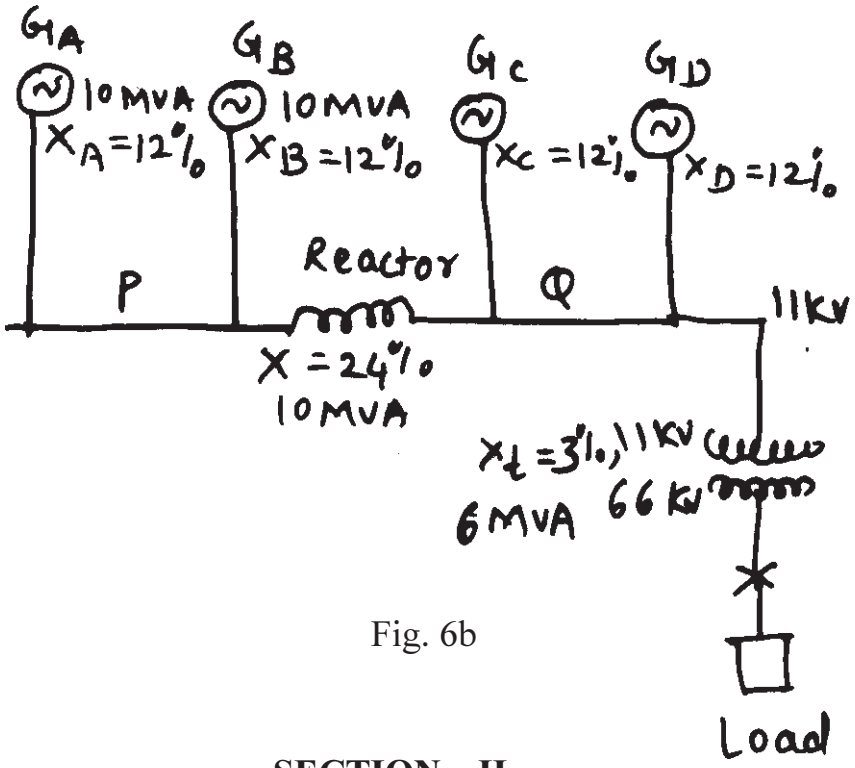


Fig. 6b

SECTION - II

Q7) a) Show that Positive and Negative sequence currents is equal in magnitude but out of phase by 180° in the Line to Line fault. Draw sequence networks. **[8]**

b) The line to neutral voltages in a three phase system are $V_{an} = 200\angle 0°$, $V_{bn} = 600\angle 100°$ $V_{cn} = 400\angle 270°$. Find the symmetrical components of the voltages. **[8]**

OR

Q8) a) Draw zero sequence diagram for all types of combinations of two winding transformer. **[8]**

b) A 3-phase generator 'A' having positive, negative and zero sequence reactances of j0.3, j0.2, j0.05pu respectively has an earthed neutral. It feeds a 3-phase line through a transformer. T_1. The transformer has $X_1 = X_2 = X_0 = j0.12$pu. and is connected in star-star with both neutrals earthed. For the line $X_1 = X_2 = j0.15$pu and $X_0 = 0.35$ pu. The other end of the line is connected to a transformer T_2 having $X_1 = X_2 = X_0 = j0.1$pu. The generator 'B' feeds T_2. The positive, negative and zero sequence reactances of generator B are j0.3, j0.2, j0.05 pu respectively has an earthed neutral. The transformer T_2 is also connected in star-star with both neutrals earthed. Find currents flowing into fault from the three lines for a double line to ground fault, occurs on secondary of T_1. Find fault current in pu. All the reactances are on same base. **[8]**

Q9) a) Form Y bus for the 4 bus system if the line series impedances are as under. **[9]**

Line (bus to bus)	Impedance
1-2	0.15+j0.6 pu
1-3	0.1+j0.4pu
1-4	0.15+j0.6pu
2-3	0.05+j0.2pu
3-4	0.05+j0.2pu

Neglect the shunt capacitance of the line.

b) Explain Gauss-Siedel method of load flow analysis with flow chart. **[9]**

OR

Q10)a) Explain in brief the procedure for formulation of Y_{bus} using singular transformation. **[9]**

b) Derive power flow equations for n bus power system and explain types of buses. **[9]**

Q11)a) Explain different types of HVDC links. Name any two HVDC systems in India. **[8]**

b) Draw single line diagram of HVDC system. Explain components of it. **[8]**

OR

Q12)a) Compare HVAC system with HVDC system. **[8]**

b) Explain in brief different control techniques used for HVDC system. **[8]**

Total No. of Questions : 12]

SEAT No. :

P1085

[Total No. of Pages : 3

[4163] - 257

T.E. (Electrical)

ENERGY AUDIT & MANAGEMENT

(2008 Pattern) (Sem. - II)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:-

1) ***Answer three questions from section I and three questions from Section II.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain short term and long term policies for energy sector. **[10]**

b) Explain salient features of Energy Conservation Act 2001. **[8]**

OR

Q2) a) Explain in detail various energy sources. **[10]**

b) What is Energy Conservation Building Code? List salient features of ECBC. **[8]**

Q3) a) Discuss in detail the objectives of Demand Side Management. **[8]**

b) Discuss ways to implement the DSM in commercial sector. **[8]**

OR

Q4) a) Explain in detail various barriers in implementing Demand Side Management. **[8]**

b) What are the duties of Energy Manager? **[8]**

P.T.O.

Q5) a) Explain the procedure of detailed energy audit. **[8]**

b) What is a Sankey diagram? Draw a typical Sankey diagram of a Process industry. **[8]**

OR

Q6) a) List various instruments and state their use in carrying out energy audit. **[8]**

b) In a steel industry the monthly production related (variable) energy consumption was 1.85 times the production and non production related (fixed) energy consumption was 16000 kWh per month upto Jan 2011. In the month of Feb 2011 a series of energy conservation measures were implemented Use CUSUM technique to develop a table and calculate energy savings for the subsequent 6 months period from the date given below. **[8]**

Month	Production (Kg)	Actual Energy Consumption (kWh)
Jan 2011	63500	114200
Feb 2011	70500	135000
Mar 2011	74000	157000
Apr 2011	58000	119100
May 2011	62000	122700
Jun 2011	72000	141400

SECTION - II

Q7) a) With suitable example explain role of electricity tariff in energy management. **[8]**

b) By using net present value analysis workout economic feasibility of following projects, by taking discounting factor of 8%. **[10]**

	Project 1	Project 2
Capital cost	Rs. 30000	Rs. 30000
Year	Savings in Rs	Savings in Rs
1	6000	6600
2	6000	6600
3	6000	6300
4	6000	6300
5	6000	5700
6	6000	5400
7	6000	5100

OR

Q8) a) A factory has an incandescent lighting load of comprising 100 numbers of 60W and 140 numbers of 100W. Calculate the payback of replacement of lamps with 1 × 40W fluorescent lamp. Lighting requirement is for 4000Hrs/year and the cost of electricity is Rs. 4/kWh and the cost of replacement is Rs. 135 per unit. Take ballast consumption as 15W each. Given data
100W incandescent lamp - 2200 lumen
60 W incandescent lamp - 1320 lumen
40W fluorescent lamp - 2400 lumen **[9]**

b) i) Explain time value of money. **[9]**
ii) Availability based tariff.
iii) Costing factors in tariff determination.

Q9) a) Estimate the reduction in power consumption of condensate transfer pump by reducing speed of the pump by 20% from its rated speed. The operating characteristics of the pump at rated speed are $38m^3$/hr discharge at a head of 65m and power drawn from the supply is 12.5 kW. **[8]**

b) What is cogeneration? Explain topping and bottoming cycle cogeneration systems with appropriate examples. **[8]**

OR

Q10)a) Enlist energy conservation measures in air conditioning system. **[8]**

b) Write notes on: **[8]**
i) Energy efficient motors.
ii) Energy conservation in industrial grade fans and blowers.

Q11)a) Discuss various alternatives for reduction of commercial losses in Indian power distribution network. **[8]**

b) The energy audit studies are carried out in a sugar industry. What can be the proposed recommendations for energy conservation in boiler and steam system? **[8]**

OR

Q12)a) It is decided to carry out energy audit of a large scale shopping mall having sizable central air conditioner load. Briefly explain methodology for air conditioning plant energy audit. **[8]**

b) Explain energy audit case study of a steel Industry. **[8]**

Total No. of Questions : 12]

SEAT No. :

P1086

[Total No. of Pages : 3

[4163] - 258

T.E. (Electrical)

UTILIZATION OF ELECTRICAL ENERGY

(2008 Pattern) (Sem. - II)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:-

1) ***Answers to the two sections should be written in separate answer books.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) State the advantages of electric heating. **[6]**

b) With a neat diagram explain Ajex Wyatt induction furnace. **[6]**

c) A resistance oven employing nichrome wire is to be heated from 220 volt, 1 phase. Supply is rated 16 kW. If temperature of element is to be limited to 1170ºC and average temperature of charge is 500ºC. Find length and diameter of wire. The radiating efficiency is 0.57, emissivity is 0.9 and specific resistance of nichrome is 109×10^{-6} ohm cm. **[6]**

OR

Q2) a) Calculate kVA and kW drawn from supply, p.f., electrical efficiency for an 3 phase electric are furnace with following data - star connected, current drawn = 4500 amp, are voltage = 50 volt, resistance of transformer referred to secondary = 0.002 ohm reactance of transformer referred to secondary = 0.004 ohm. **[6]**

b) Explain dielectric heating with suitable diagram. State the applications of dielectric heating. **[6]**

c) With a suitable diagram explain ultrasonic welding. **[6]**

Q3) a) State principle of anodising and state its applications. **[8]**

b) With a suitable diagram explain electric circuit used in refrigerator. **[8]**

P.T.O.

OR

Q4) a) With a suitable diagram explain electric circuit used in water cooler. **[8]**

b) Write a short note on electroplating. **[8]**

Q5) a) Define following terms - solid angle, luminous efficiency, coefficient of utilization, reflection factor. **[8]**

b) Explain metal halide lamp with a suitable diagram. **[8]**

OR

Q6) a) Elaborate the steps involved in design of illumination scheme for indoor installation. **[8]**

b) Explain construction and working of compact flourocent lamp with a suitable diagram. **[8]**

SECTION - II

Q7) a) Draw block diagram of AC locomotive & explain it. **[8]**

b) Compare steam engine drive with electric drive. **[8]**

OR

Q8) a) What are various systems of electric traction? Discuss any one in brief. **[8]**

b) What is collector for over head system? Explain pantograph current collector system. **[8]**

Q9) a) Draw and explain speed time curve for urban, suburban & main line service. **[9]**

b) A suburban electric train has maximum speed of 70 km/hr. The schedule speed including a stop of 30 sec in 45 km/hr. If acceleration is 1.5 kmphps, find the value of retardation when average distance between stops is 4 km. **[9]**

OR

Q10) a) Derive the expression for coasting time, braking time in terms of maximum speeds during acceleration & retardation in case of quadrilateral speed - time curve. **[9]**

b) An electric train is to have acceleration & braking retardation of 0.8 kmphps and 3.2 kmphps respectively. If the ratio of maximum to average speed 1.3 and time for stop is 26 seconds. Find schedule speed for a run of 1.5 km. Assume simplified trupezoidal speed time curve. **[9]**

Q11)a) Explain desired electrical & mechanical characteristics of electric motors for traction work. **[8]**

b) Explain suitability of dc series motor for traction service. **[8]**

OR

Q12)a) Compare shunt transition & bridge transition. **[8]**

b) Explain how regenerative braking is used in electric traction. **[8]**

Total No. of Questions : 12]

SEAT No. :

P1087

[Total No. of Pages : 4

[4163] - 259

T.E. (Electrical)

DESIGN OF ELECTRICAL MACHINES

(2008 Pattern) (Sem. - II)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:-

1) ***Answer Q1 or Q2, Q3 or Q4, Q5 or Q6 questions from Section I, and Q7 or Q8, Q9 or Q10, Q11 or Q12 questions from Section II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Write a short note on rotating hysteresis and pulsation losses in electrical machines. **[8]**

b) The core of transformer has an iron loss of 100 W at 40 Hz and 70W at 30 Hz. Find the eddy current loss at 50 Hz? **[4]**

c) Define: **[4]**

i) Leakage coefficient ii) Window Space Factor

iii) Stacking Factor iv) Real Flux Density

OR

Q2) a) Explain Carter's fringe curves and air gap flux distribution factor in detail. **[8]**

b) Explain the principal components of leakage flux for polyphase machines. **[8]**

Q3) a) Derive output equation of single phase core type transformer. **[6]**

b) With reference to heating and cooling curves, explain heating time constant and cooling time constant. **[6]**

P.T.O.

c) Determine the main dimensions of core and yoke for a 200kVA, 50Hz, single phase core type transformer. A cruciform core is used with distance between adjacent limbs equal to 1.5 times the width of core laminations. Assume voltage per turn = 14V, maximum flux density = 1.2 tesla, window space factor = 0.30, current density = 2.5 A/mm^2, stacking factor = 0.9. The net iron area is 0.56 d^2 in a cruciform core, where d is the diameter of circumscribing circle. Also the width of largest stamping is 0.85d. **[6]**

OR

Q4) a) Explain specifications of transformer as per IS 2026. **[6]**

b) Differentiate between power transformer and distribution transformer. **[4]**

c) Determine the main dimensions of core, yoke, number of turns of primary and secondary windings and the cross-section of the conductors for a 5 kVA, 11000/400V, 50Hz, single phase core type distribution transformer. The net conductor area in the window is 0.5 times the net cross-section of iron in the core. Assume square cross-section for the core and following parameters as

maximum flux density = 1.2 tesla, window space factor = 0.2,

current density = 1.2 A/mm^2, stacking factor = 0.9.

The height of window is 3 times width of the window. **[8]**

Q5) a) Discuss the mechanical forces in transformers and explain how they are taken into consideration while fabricating and how the mechanical bracing is provided. **[8]**

b) A 100kVA, 2000/400V, 50 Hz, single phase shell type transformer has sandwich coils. There are two full HV coils, one full LV coil and two half LV coils. Calculate the value of leakage reactance referred to HV side. Also calculate per unit leakage reactance. The data given is

Depth of HV coil = 38mm, Depth of LV coil = 36mm,

Number of primary turns = 200, Width of winding = 0.12m,

Depth of duct between LV and HV = 16mm,

Length of mean turn = 1.5m. **[8]**

OR

Q6) a) Explain the procedure to estimate active and reactive components of no load current of single phase core type transformer. **[8]**

b) A 500 kVA 7500/440V, 50 Hz single phase core type transformer has the following data:

Width of HV winding = 23mm; Width of LV winding = 20mm; Width of duct = 15mm; length of mean turn = 1.25m; number of turns in HV winding = 180; unit impedance = 0.036, height of coils = 0.35m, doubling effect multiplier = 1.8. **[8]**

i) Find the instantaneous radial force on HV winding under short circuit conditions if the height of HV and LV windings is equal.

ii) Find the instantaneous axial force on HV winding under short circuit conditions if the HV winding is 6% shorter than LV winding at one end.

SECTION - II

Q7) a) Derive output equation of three phase induction motor. **[8]**

b) Determine the main dimensions, number of stator slots and number of conductors for 15 HP, 400V, 50 Hz, 1440 rpm, delta connected induction motor. Assume specific magnetic loading of 0.5T, specific electrical loading of 23000 A/m, fullload efficiency of 0.885 and full load power factor as 0.866. Take ratio of core length and core pitch as 1.25. Stator employs double layer winding with winding factor of 0.955. **[10]**

OR

Q8) a) Discuss factor which govern the choice of electrical loading and specific magnetic loading for a three phase induction motor. **[10]**

b) Draw layout of three phase double layer lap winding for machine having 4 pole, 24 slots with 2 coils per side per slot. **[8]**

Q9) a) Which factors should be considered when estimating the length of air gap of induction motor? Why the air gap should be as small as possible. **[8]**

b) Discuss various constraints in the selection of suitable combinations of stator and rotor slots in case of three phase induction motor. **[8]**

OR

Q10)a) Derive the equation for end ring current of squirrel cage induction motor. **[8]**

b) Explain different methods to eliminate harmonic torques. **[8]**

Q11)a) Discuss various components involved for calculation of loss component of no load current. **[8]**

b) Explain different types of leakage reactances in an induction motor. **[8]**

OR

Q12)a) Write short note on effect of saturation of performance of three phase induction motor. **[8]**

b) A 15kW, 415v, 50Hz, 6 pole, 3 phase star connected induction motor has a magnetizing current which is 60 percent of the full load current. Calculate stator turns per phase if mmf required for flux density at 30º from pole axis is 450A. Assume winding factor of 0.94, full load efficiency 0.95 and fullload power factor of 0.86. **[8]**

Total No. of Questions : 12]

SEAT No. : ____

P1088

[Total No. of Pages : 7

[4163] - 260

T.E. (Electrical)

CONTROL SYSTEM - I

(2008 Pattern) (Sem. - II)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answer 3 questions from Section - I and 3 questions from Section - II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Unit - I

Q1) a) Compare open loop and closed loop system with a example, advantages and disadvantages. **[8]**

b) Using Block diagram reduction method, find the closed loop transfer function of the following system. **[8]**

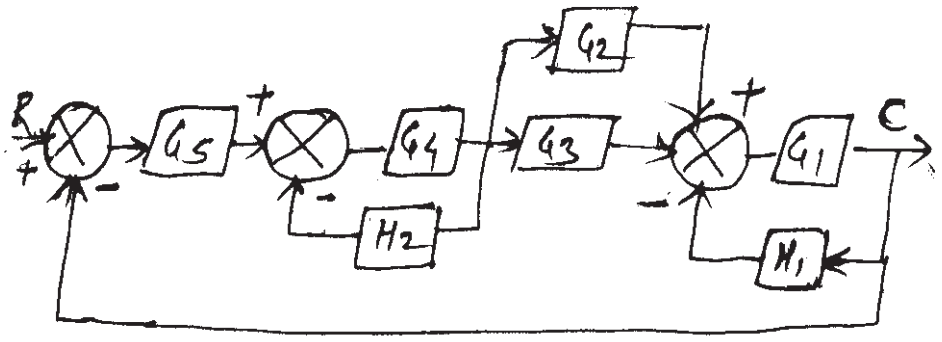


Fig 1

P.T.O.

OR

Q2) a) Obtain differential equation of mechanical system and hence draw a electrical analogous circuit based on F-I analogy. **[8]**

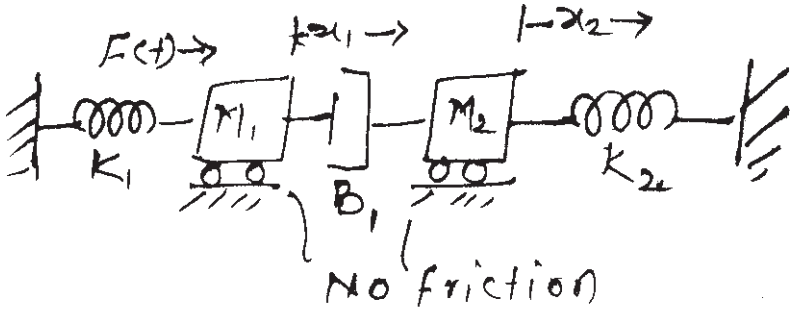


Fig 2

b) For a given signal flow graph using Mason's gain formula find gain of the system. **[8]**

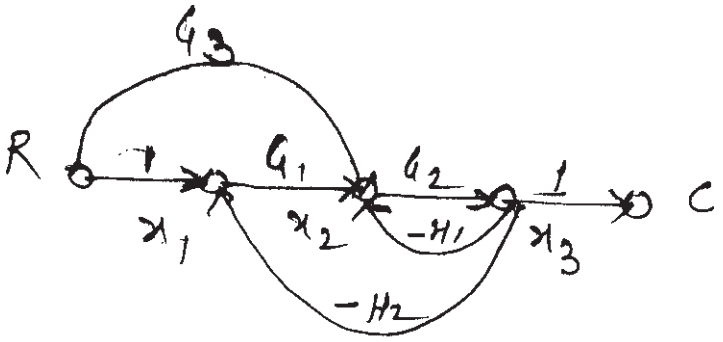


Fig 3

Unit - II

Q3) a) Differentiate between transient response and steady state response with sketch. Explain **[8]**

i) Rise time ii) Peak time

iii) Maximum Overshoot iv) Settling time

b) The open loop transfer function of a system with unity feedback gain is given as $G(s) = \frac{20}{s^2 + 5s + 6}$

Determine the damping ratio, Maximum overshoot, rise time and peak time. **[8]**

OR

Q4) a) Explain steady state error for second order system. Derive

$e_{ss} = \lim_{s \to 0} \frac{SR(s)}{1 + G(s)H(s)}$ where R(s), G(s), H(s) are input, open loop transfer function and feedback transfer function respectively.

Also explain

i) Position Error Constant

ii) Velocity Error Constant. **[8]**

b) For Unity feedback system having open loop transfer function $G(s) = \frac{k(s + 2)}{s^2(s^2 + 7s + 12)}$

Determine

i) Type number of system

ii) Error constant

iii) Steady state error **[8]**

Unit - III

Q5) a) Explain impulse response of the system depending upon location of poles for **[8]**

i) Real poles

ii) Complex poles

iii) Repeated poles

b) For characteristic equation of feedback control system $S^4 + 25S^3 + 15S^2 + 20S + K = 0$ determine the range of K for stability by Routh - Harwitz Criteria. Determine the value of K so that system is marginally stable. Also find the frequency of sustained oscillations.**[10]**

OR

Q6) a) Explain the terms **[6]**

i) Stability ii) Absolute stable

iii) Relative stable iv) Marginal Stable

b) Obtain Root locus for unity feedback system with open loop transfer function $G(s) = \frac{k}{s(s^2 + 6s + 25)}$ **[12]**

SECTION - II

Unit - IV

Q7) a) Define and explain frequency domain specifications. **[6]**

b) Draw the bode plot for the system having unity feedback whose open loop transfer function is $G(s) = \frac{10}{s(1+0.1s)(1+0.04s)}$

Also determine

i) W_{ge} ii) W_{pc}

iii) GM iv) PM and

v) Stability. **[12]**

OR

Q8) a) Sketch the polar plot for the system whose open loop transfer function $G(s)\,H(s) = \frac{7}{s(1+s)(1+0.5s)}$ Comment on stability. **[6]**

b) Sketch the Nyquist plot and determine stability for $G(s)\,H(s) = \frac{1}{(1+s)(1+2s)}$. **[12]**

Unit - V

Q9) a) Define and explain following terms: **[8]**

i) State space ii) State

iii) State equation iv) State variable

b) The state variable formulation of a system is given by

$$\dot{x}=\begin{bmatrix}-2 & 0\\ 0 & -1\end{bmatrix}x+\begin{bmatrix}0\\ 1\end{bmatrix}\mu$$

$$y = [1\ 0]\ x$$

Determine transfer function. **[8]**

OR

Q10)a) Obtain the state model by using parallel decomposition for

$$\frac{y(s)}{V(s)} = \frac{6}{s^3 + 6s^2 + 11s + 6}$$ **[8]**

b) A system is governed by the differential equation

$$\frac{d^3y}{dt^3} + 6\frac{d^2y}{dt^2} + 11\frac{dy}{dt} + 10y = 8\mu$$

Where y is output and μ is input. Obtain state space representation of the system. **[8]**

Unit - VI

Q11)a) Explain the circuits and transfer function of lead and lag compensator. **[8]**

b) Explain the characteristics and transfer function of

i) PI controller

ii) PD controller

iii) PID controller. **[8]**

OR

Q12)a) Write short note on following control system components. **[8]**

i) Tachogenerator

ii) Potentiometer.

b) Explain in detail **[8]**

i) armature controlled

ii) field controlled D.C. servomotor.

Total No. of Questions : 12] **SEAT No. :**

P1089 **[Total No. of Pages : 3**

[4163] - 261

T.E. (Electronics Engineering)

FEEDBACK CONTROL SYSTEMS

(2008 Pattern) (Sem. - I)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:-

1) ***Answers to the two sections should be written in separate answer books.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) State Mason's gain formula and explain it with an example. **[8]**

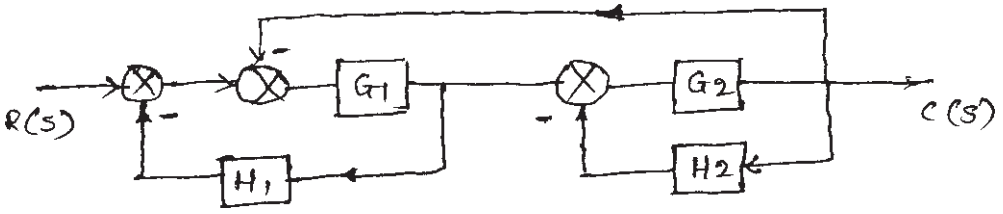
b) Write short notes on: **[8]**

i) Feedback & feed forward control system.

ii) Stepper motor

OR

Q2) a) Reduce the block diagram & obtain closed loap transfer function. **[8]**



b) Distinguish between open loap & closed loap control system. **[8]**

Q3) a) Comment on different test signals used in control system? When are they applied. **[6]**

b) A second order control system has $F(s) = s^2 + 2.4s + 9$. If a step input is applied to it, determine time domain specification. Sketch the response. **[10]**

OR

Q4) a) A unity feedback control system has $G(s) = k/s\ (s^2 + 4s + 5)\ (s + 2)$. Determine range of k so that system is stable. **[6]**

P.T.O.

b) The feedback control system has **[10]**

$$G(s)\,H(s) = \frac{k}{s(s+2)(s^2+6s+13)}.$$

Draw complete root locus. Comment on stability of the system.

Q5) a) Explain the terms **[6]**

i) Phase margin ii) gain margin

& state their importance.

b) A feedback control system has **[12]**

$$G(s)\,H(s) = \frac{s+160}{s(s+4)(s+40)}$$

Sketching Bode plots determine closed loap stability of the system.

OR

Q6) Write short notes on: **[18]**

a) Compensating networks.

b) Frequency domain specifications.

SECTION - II

Q7) a) What are the advantages of state space analysis over conventional control system. **[8]**

b) Obtain the state transition matrix for system. **[8]**

$$\begin{bmatrix} x_1 \\ x_2 \end{bmatrix} = \begin{bmatrix} -3 & 1 \\ 0 & -1 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix}$$

OR

Q8) a) Obtain a state Spaie model of the system with transfer function. **[8]**

$$\frac{Y(s)}{U(s)} = \frac{6}{s^3+6s^2+11s+6}$$

b) State the properties of state transition matrix. **[8]**

Q9) a) What are thermestors? State the advantages, limitations and applications of thermestors. **[8]**

b) Draw the ladder diagram for an automatic washing machine & explain it. **[10]**

OR

Q10)a) Explain the integral control mode? State its characteristics. **[8]**

b) Write a note on PID controller. **[10]**

Q11)a) Draw a general schematic of fuzzy controller & explain the function of each block. **[8]**

b) What is fuzzification & defuzzification. **[8]**

OR

Q12)a) Explain with neat diagram the biological & artificial neuron model. **[8]**

b) Explain the following terms w.r.t. neural networks. **[8]**

i) Supervised learning.

ii) Unsupervised learning.

Total No. of Questions : 12]

SEAT No. :

P1090

[Total No. of Pages : 5

[4163] - 262

T.E. (Electronics)

DATA COMMUNICATION

(2008 Pattern) (Sem. - I)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:-

1) ***Answers to the two sections should be written in separate answer books.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) With a suitable example explain what is random process. What is ensemble average & time average. **[8]**

b) Find the PSD of a random process given by $x(t) = A \cos (w_{et} + \varphi)$. Where φ is a random variable uniformly distributed over the range $(0 - 2\pi)$. **[8]**

OR

Q2) a) Explain the following terms: **[8]**

i) Wide sense stationary process.
ii) Ergodic process.
iii) Auto-correlation function.
iv) Power spectral density.

b) Explain various probability distribution functions. **[8]**

Q3) a) What are the desirable properties of line codes? Which properties are satisfied by manchester code & how. **[8]**

b) Derive the expression for PSD of polar signaling i.e. 1 transmitted by +p(t) & 0 by –p(t) consider number of ones and zeros are equiprobable. **[8]**

P.T.O.

OR

Q4) a) What is the need of bit/symbol synchronization consider integrate & dump receiver for BPSK explain where & how bit synchronizer is useful. **[6]**

b) Why pulse shaping is important. Explain intersymbol interference. **[4]**

c) For a bit stream 1 0 1 1 0 1 0 plot the following line codes.

i) Bipolar NRZ,

ii) Manchester

iii) AMI

plot all the line codes in synchronization with clock signal. **[6]**

Q5) a) For a systematic LBC the three parity check digits C_4, C_5, C_6 are given by

$C_4 = d_1 \oplus d_2 \oplus d_3$

$C_5 = d_1 \oplus d_2$

$C_6 = d_1 \oplus d_3$

i) Construct generator matrix

ii) Construct code generated by this matrix.

iii) Determine error correcting capability.

iv) Prepare a suitable decoding table.

v) Decode the received words 1 0 1 1 0 0 and 1 0 1 0 1 0 **[10]**

b) Explain following error control systems **[8]**

i) Stop & wait

ii) go back N

iii) Selective repeat.

OR

Q6) a) For a state diagram given in figure a. of a convolutional code construct code trellis. Find out code vector for input data sequence 1 0 1 1 0 1 0 1 0 (consider MSB (1) as first bit & LSB (0) as last bit data). Consider initial state is state a (00). **[9]**

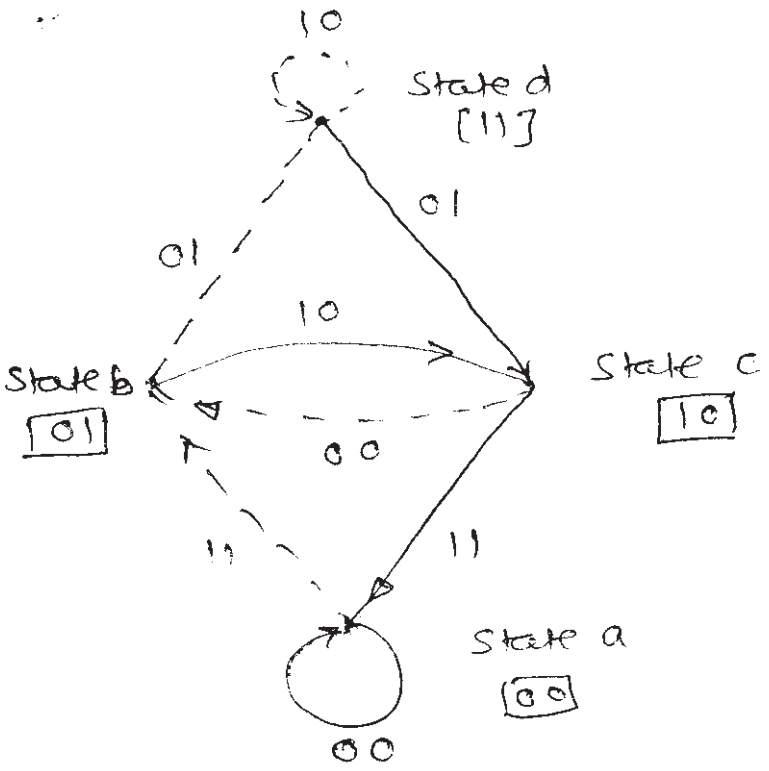


figure a

Note: Solid lines when the input bit is 0 & dashed lines when input bit is 1.

b) Explain Viterbi's decoding & sequential decoding & compare them. Use code trellis generated in Q.6.a. **[9]**

SECTION - II

Q7) a) What is mutual information? How channel capacity is related to mutual information? Explain with mathematical support. **[8]**

b) Binary channel matrix is given by

$$\begin{array}{c} \\ x_1 \\ x_2 \end{array} \begin{array}{c} \begin{array}{cc} y_1 & y_2 \end{array} \\ \begin{bmatrix} 2/3 & 1/3 \\ 1/10 & 9/10 \end{bmatrix} \end{array}$$

$p_x(x_1) = 1/3, p_x(x_2) = 2/3$

Determine H(x), H(x|y), H(y), H(y|x) & I(x; y) **[8]**

OR

Q8) a) A discrete memory less source has an alphabet of seven symbols whose probabilities of occurrence are as described here : **[8]**

Symbol	S_0	S_1	S_2	S_3	S_4	S_5	S_6
Probability	0.25	0.25	0.125	0.125	0.125	0.0625	0.0625

Compute the Huffman code for this source, moving a "combined" symbol as high as possible. Explain why the computed source code has an efficiency of 100 percent.

b) What is entropy? For a discrete memory less source what is the upperbound on entropy. Show that equiprobable messages results to maximum entropy. **[8]**

Q9) a) What is the advantage of MSK? MSK output is given by :

$$V_{MSK}(t) = \sqrt{2Ps}\left[\frac{bo(t)+be(t)}{2}\right]\sin(wo+\Omega)t$$

$$+\sqrt{2Ps}\left[\frac{bo(t)-be(t)}{2}\right]\sin(wo-\Omega)t$$

where $\Omega = \frac{2\pi}{4Tb} = 2\pi\left(\frac{fb}{4}\right)$

How to select f_H & f_L? Draw signal space representation. Why it is called as MSK? **[9]**

b) Draw signal space representation of 16 QAM & show that 16 QAM have lower error rate than 16 PSK but higher than QPSK. **[9]**

OR

Q10)a) Explain QPSK demodulater with neat block diagram. Write integration limits of each integrator. What is the band width requirement of QPSK.**[7]**

b) Plot power spectral density of BPSK output & input bit stream (input data). **[3]**

c) Plot the PSD of BFSK output. What is the bandwidth required? Explain BFSK receiver (coherent or non-coherent receiver). **[8]**

Q11)a) For a DS-SS communication compute (Eb/No) for expected probability of error 0.387×10^{-5} Bit duration is 4.095 ms & chip duration is 1 μs. Compute processing gain. Compute required period of PN sequence & number of shift register required. Calculate jamming margin. Use error function chart as follow. **[8]**

x	erfc(x)
1.4142	0.0455
2	0.0047
2.236	0.0016
3	2.209×10^{-5}
3.162	7.744×10^{-6}

b) With the help of Block diagram explain FH-SS transmitter & receiver. What is slow and fast frequency hopping. **[8]**

OR

Q12)a) Explain multiple access techniques TDMA, FDMA & CDMA. **[8]**

b) Figure b shows a four-stage shift register. The initial state of the shift register is 1000 findout the output sequence. Show how it satisfies balance & run property. **[8]**

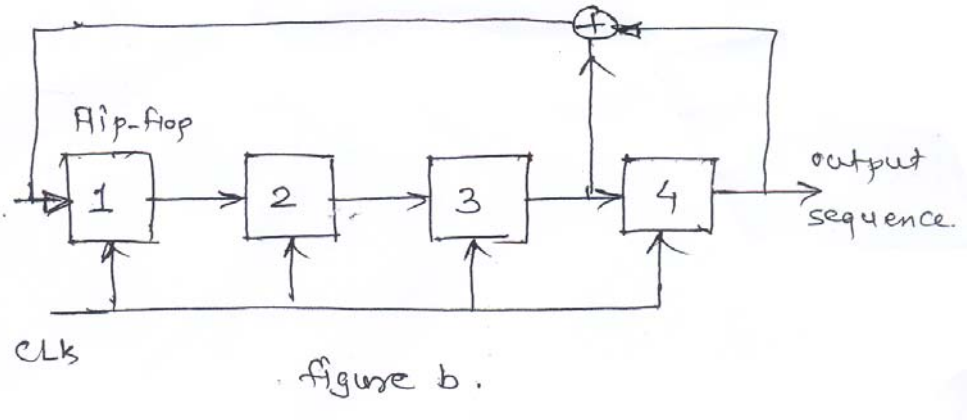


figure b.

Total No. of Questions : 12]

SEAT No. :

P1091

[Total No. of Pages : 4

[4163] - 263

T.E. (Electronics)

NETWORK SYNTHESIS AND FILTER DESIGN

(2008 Pattern) (Sem. -I)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer 3 questions from section - I and 3 questions from section - II.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain the elementary synthesis concepts. **[6]**

i) Removal of a pole at Infinity.

ii) Removal of pole at origin.

iii) Removal of conjugate Imaginary poles.

b) i) Test whether the polynomial $2S^6 + S^5 + 13S^4 + 6S^3 + 56S^2 + 25S + 25$ is Hurwitz. **[4]**

ii) Test whether the polynomial $S^5 + 3S^3 + 2S$ is Hurwitz. **[4]**

iii) Explain the properties of Hurwitz polynomial. **[2]**

OR

Q2) a) i) What are the necessary and sufficient condition for positive real function, Explain in detail. **[4]**

ii) Explain the properties of positive real function. **[3]**

b) i) Test whether $F(S) = \frac{S^3+6S^2+7S+3}{S^2+2S+1}$ is positive real function. **[4]**

ii) Test whether $F(S) = \frac{S(S+3)(S+5)}{(S+1)(S+4)}$ is positive real function. **[5]**

P.T.O.

Q3) a) Realize foster forms of the following LC impedance function. **[6]**

$$Z(S)=\frac{(S^2+1)(S^2+3)}{S(S^2+2)(S^2+4)}$$

b) i) Realize following RLC functions. **[6]**

$$Z(S)=\frac{S^2+2S+2}{S^2+S+1}$$

ii) State the properties of RLC function. **[4]**

OR

Q4) a) Determine the foster forms of realization of RC impedance function. **[6]**

$$Z(S)=\frac{(S+1)(S+3)}{S(S+2)(S+4)}$$

b) i) Realize cauer forms of the following LC impedance function. **[6]**

ii) State the properties of LC impedance function. **[4]**

Q5) a) i) Explain the properties of Y_{21} and Z_{21} with $1\,\Omega$ termination. **[6]**

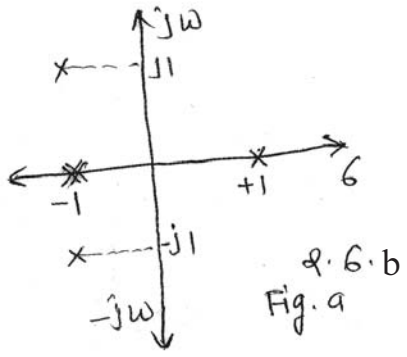
ii) Synthesize the voltage ratio $\frac{V_2}{V_1}=\frac{(S+2)(S+4)}{(S+3)(3S+4)}$ interms of constant resistance bridged T circuits connected in Tandem. **[6]**

b) Explain Zeros of transmission, synthesize $Z_{21}(S)=\frac{S^3}{S^3+3S^2+4S+2}$ **[6]**

OR

Q6) a) Synthesize $Y_{21}(S)=\frac{S^2}{S^3+3S^2+4S+2}$ **[6]**

b) Synthesize the all pass function $\frac{V_2}{V_g}=\frac{1}{2}\frac{(S-1)}{(S+1)}\frac{(S^2-2S+2)}{(S^2+2S+2)}$ Whose pole zero diagram is shown in fig. (a). **[6]**



Q. 6. b
Fig. a

c) Prove that the $\frac{V_2}{V_g} = \frac{1}{2}\left[\frac{R - Za}{R + Za}\right]$ of a constant resistance lattice whose source and load impedances are equal to R. **[6]**

SECTION - II

Q7) a) Determine the order of Low Pass Butterworth filter that is to provide 40dB attenuation at a frequency which is of Cut-off frequency. **[6]**

b) Derive equation of pole location of Butterworth analog circuit. **[10]**

OR

Q8) a) What are the properties of Chebyshev polynomials. **[6]**

b) Obtain a system function H(S) that exhibits the Chebyshev characteristics with not more than 1dB ripple in PB and attenuation of 20dB at w = 2 rad / sec. **[10]**

Q9) a) Comparision between Butterworth & Chebyshev filter. **[6]**

b) Synthesis a 2^{nd} order Low Pass Butterworth filter to have a cut-off of 159.15 kHz. Then using RC-CR transformation realizes HPF with same cut-off frequency. **[10]**

OR

Q10)a) What are the advantages and disadvantages of Active filters. **[4]**

b) Design Sallen Key 2^{nd} order Butterworth LPF having upper cut-off frequency 1kHz. **[8]**

c) Write a short notes on Butterworth filters. **[4]**

Q11)a) Explain effect of following OP-AMP characteristics on the active filters. **[10]**

i) Input offset voltage
ii) Slew rate.
iii) Input Bias current
iv) Dynamic Range
v) CMRR

b) Find the Frequency Dependent negative Resistance RC realization for passive Ladder type BPF (Fig 11. b) **[8]**

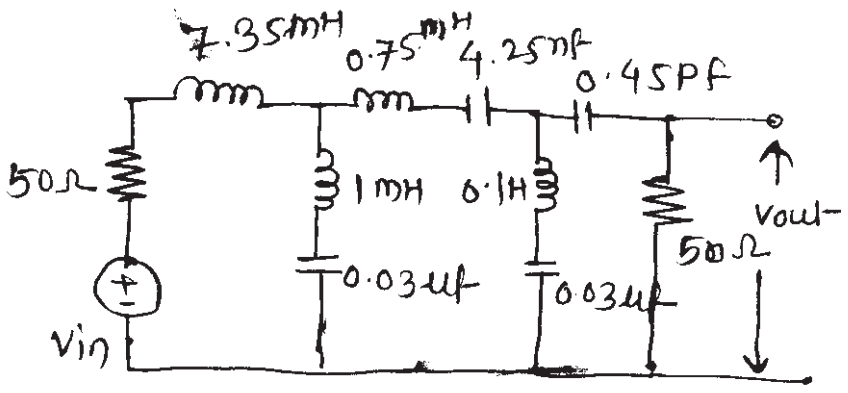


Fig. Q. 11. b.

OR

Q12)a) Write a short note: **[12]**

i) Elliptic Approximation.

ii) Frequency Normalization.

iii) Gain Enhancement in Active filter.

b) What is the effect of component type on gain sensitivity? Explain in detail with necessary mathematical expression. **[6]**

Total No. of Questions : 12]

SEAT No. :

P1092

[Total No. of Pages : 2

[4163] - 264

T.E. (Electronics)

MICROCONTROLLERS

(2008 Pattern) (Sem. - I)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams indicate full marks.***
4) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain the Architecture of 8051 microcontroller. **[8]**

b) Draw and explain the interfacing of 8051 based system with 8k bytes of program ROM and 8 k bytes of data ROM. **[8]**

OR

Q2) a) Explain the Architecture of 8 bit microprocessor. **[8]**

b) Compare Harvard architecture and von-Neumann architecture. **[4]**

c) Explain the criteria for choosing a microcontroller. **[4]**

Q3) a) Explain the structure of port-1 in 8051 microcontroller. **[8]**

b) Explain the MOVC instruction. Write a program to get the *x* value from port P1 and send to port P2 continuously. Port P1 read value of *x* which is stored in Look-Up table. **[8]**

OR

Q4) a) Explain the following instructions with suitable example. **[10]**

i) MOVX A, @ DPTR ii) SWAP A

iii) ADDC A, Rn iv) PUSH

v) DJNZ

b) Explain the program status word register (PSW) of 8051 microcontroller. **[6]**

P.T.O.

Q5) a) Draw the interfacing diagram of 16× 2 LCD with 8051. Write a program to interface 16 × 2 LCD with 8051 and display the name "DELHI" on LCD. **[9]**

b) Explain the TMOD Register. Write a program to generate a square wave with an ON Time 3ms and an OFF time of 10ms on all pins of port 0. Assume that XTAL = 22 MHz. **[9]**

OR

Q6) a) Describe the 8051 interfacing with stepper motor. Write a program to rotate a motor 64 Degree in clockwise direction. The motor has a step angle 2 Degree. Use 4-step sequence. **[9]**

b) Explain TCON Register. **[4]**

c) What in key denouncing? Draw the Flow chart of Key board interfacing. **[5]**

SECTION - II

Q7) a) Explain SPI Protocol. **[9]**

b) Port 0 of an 8051 is used to monitor a parameter in an industrial environment. If the parameter gives a reading above 0FH, a message "HI" is to be sent serially. Otherwise a message "OK" is to be sent serially. The word "HI" & "OK" are burned in to program ROM location. **[9]**

OR

Q8) a) Explain SBUF and SCON Register. **[9]**

b) What is resolution of ADC? What are selection criteria for ADC? Explain the PIN diagram of ADC 0804. **[9]**

Q9) a) Compare PIC microcontroller with 8051 microcontroller. State the feature of 16FXX Microcontroller. **[10]**

b) Explain the WREG in PIC Microcontroller. **[6]**

OR

Q10)a) Explain the PIC 16FXX With block diagram. **[10]**

b) Explain the memory organization of PIC Microcontroller. **[6]**

Q11)What are the drawback of thermister over LM 35 Temperature sensor? Draw the connection diagram of temperature sensor with 8051. Write a program to read and Display temperature in assembly or c. **[16]**

OR

Q12)a) Design microcontroller based path follower. **[10]**

b) Explain designing consideration of interfacing of LED to 8051 / PIC. **[6]**

Total No. of Questions : 12] **SEAT No. :**

P1097 **[Total No. of Pages : 2**

[4163] - 269
T.E. (Electronics)
INDUSTRIAL MANAGEMENT
(New) (New for the Fresh Students only)
(Sem. - II)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:-

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Discuss three levels of management with two function of each level. **[8]**

b) Explain any eight principles of management distinguished by Henry Fayol. **[8]**

OR

Q2) a) Discuss controlling as function of management in detail with steps & flow chart. **[8]**

b) Draw organisation chart of a line & staff organisation. Give four merits & Demerits. **[8]**

Q3) a) Explain Mintzberg's five p's of strategy. **[8]**

b) Explain the impact of eight environment sector on electronics manufacturing unit. **[8]**

OR

Q4) a) What are Porter's five forces? Explain in brief. **[8]**

b) Draw and explain four cells of BCG matrix. **[8]**

Q5) a) Discuss the operation of Quality circles in industry with all nine steps indetail. **[10]**

b) Write short notes (Any two) **[8]**

i) TQM

ii) Kaizen

iii) Five 's' (5 's')

OR

P.T.O.

Q6) a) Explain the importance of ISO 9001 : 2000 quality management system standards. **[10]**

b) Write short notes (Any two) **[8]**

i) Co-operative society

ii) Globalization.

iii) Contribution of Elton Mayo.

SECTION - II

Q7) a) Explain following terms regarding Break - Even - Analysis **[10]**

i) Angle of incidence

ii) Contribution

iii) P/V Ratio.

iv) Margin of safety.

b) Explain the difference between functions of money market & capital market. **[8]**

OR

Q8) a) Define fixed capital & working capital. What are the financial sources to raise these capitals. **[10]**

b) Explain the role of Securities & Exchange Board of India (SEBI). **[8]**

Q9) a) What are the functions involved in HRM. **[8]**

b) What are the traits of good HR professional (competencies)? **[8]**

OR

Q10) a) Why Talent Aquisition is always on top priority in the role of HR. **[8]**

b) How selection strategies will be different for fresher & experienced electronics engineer. **[8]**

Q11) a) Compare in detail MIS & DSS on following two grounds. **[8]**

i) Decision support

ii) Form of information

b) What is electronic commerce? Explain various models used in brief. **[8]**

OR

Q12) a) What is DSS? Explain different types of analytical modeling. **[8]**

b) What is ERP? State basic features of ERP. **[8]**

Total No. of Questions : 12]

P1097 [Total No. of Pages : 2

[4163]-269
T.E. (Electronics)
INDUSTRIAL MANAGEMENT
(Old) (Old for the Repeater Students Only) (Sem. - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer three questions from section-I and three questions from section-II.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) State and explain F.W.Taylor's theory of scientific management. **[9]**

b) Define the term Management. Explain various functions of management in brief. **[9]**

OR

Q2) a) Define Quality. Explain the phases in Quality Management. **[9]**

b) Define the terms 'data' and 'information'. Explain the characteristics of information. **[9]**

Q3) a) Classify and explain with neat diagram, three types of network topology. State the advantages and disadvantages of each. **[8]**

b) List out the 10 technology shift from analog to digital economy. Explain how they develop competition in the market? **[8]**

OR

Q4) a) What do you understand by Data Communication? Describe the role and advantages of Satellite Communication. **[8]**

b) What is Convergence Technology (CT)? Explain how the modern day mobile handsets are a classic example of Convergence Technology. **[8]**

Q5) a) Explain Business Process Re-engineering (BPR). List its advantages. **[8]**

b) Explain Supply Chain Management (SCM) in detail. **[8]**

P.T.O.

OR

Q6) a) Describe Information System (IS) design for Internetworked Business (Level - 1 to 5). **[8]**

b) Write short note on (any one) : **[8]**

i) Error model.

ii) Hospital care system.

SECTION - II

Q7) Distinguish between 'Traditional' and 'Open System' view of Business IS. Construct the block diagram and explain how open system view is a multistage decision making process. **[18]**

OR

Q8) Explain errors caused by stem environmental factors and the uncertainty implications. **[18]**

Q9) State and explain the concept of system dynamic model. List out various steps in system dynamics method. **[16]**

OR

Q10) a) What is a feedback loop? Explain positive and negative feedback loop. **[8]**

b) Explain STELLA with reference to following : **[8]**

i) Mapping and modeling.

ii) Simulation and analysis.

Q11) Write short notes on : **[16]**

a) Cost benefit analysis.

b) Accuracy and consistency.

OR

Q12) Explain concept of Usefulness-Usability-Integrity (UUI) paradigm. **[16]**

Total No. of Questions : 12]

SEAT No. :

P1098

[Total No. of Pages : 4

[4163] - 270
T.E. (Electronics)
DISCRETE TIME SIGNAL PROCESSING
(2008 Pattern) (Sem. - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to candidates:

1) ***Answer 3 questions from Section - I and 3 questions from Section - II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of electronic pocket calculator and is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Discrete Time systems $h_1(n)$ and $h_2(n)$ are connected in cascade. **[6]**

$$h_1(n)=\left\{\frac{1}{2},\frac{1}{4},\frac{1}{2}\right\}$$

$$h_2(n)=\delta(n-2)$$

Determine the response of the overall system to the input

$x(n)=\delta(n+2)+3\delta(n-1)-4\delta(n-3)$.

b) A DT system is represented by the following equation **[6]**

$$y(n)=\frac{3}{2}y(n-1)-\frac{1}{2}y(n-2)+x(n)$$

with initial conditions

$y(-1)=0$

$y(-2)=-2$

and $x(n)=\left(\frac{1}{4}\right)^n u(n)$

Determine i) Zero input response.

ii) Zero state response.

iii) Total response of the system.

P.T.O

c) An analog ECG signal contains useful frequencies upto 100Hz.

i) What is Nyquist rate for this signal?

ii) If this signal is sampled at the rate of 250 samples/sec. What is the highest frequency that can be represented by this sampling rate? **[6]**

OR

Q2) a) Explain causality of LTI systems. **[6]**

b) Determine the range of values 'a' and 'b', for which the LTI system with impulse response. **[6]**

$$h(n)=\begin{cases} a^n & n \geq 0 \\ b^n & n<0 \end{cases}$$

is stable.

c) A 100 Hz sinusoid $x(t)$ is sampled at 240 Hz. Has aliasing occured? How many full periods of $x(t)$ are required to obtain one period of the sampled signal? **[6]**

Q3) a) Use the 8-point radix - 2 DITFFT algorithm to find the DFT of the sequence

$x(n) = \{0.707, 1, 0.707, 0, -0.707, -1, -0.707, 0\}$. **[8]**

b) Determine the DTFS coefficients to evaluate DTFS representation of following $x(n)$.

$$x(n)=\cos\left[\frac{6\pi}{13}n+\frac{\pi}{6}\right].$$ **[8]**

OR

Q4) a) State and prove periodicity and linearity properties of DFT. **[8]**

b) Compute the DFT of the following sequence. **[8]**

$x(n) = \{0,1,2,3\}$.

Q5) a) Plot the pole-zero pattern and determine which of the system is stable.

i) $y(n)=y(n-1)-0.5\,y(n-2)+x(n)+x(n-1)$

ii) $y(n)=0.7\,y(n-1)-0.1\,y(n-2)+2x(n)-x(n-2)$. **[8]**

b) State the six properties of z-transform and prove differentiation in z-domain property. **[8]**

OR

Q6) a) Find the transfer function and difference equation of the system,

$h(n)=2^n u(n)-3^n u(n)$. **[8]**

b) Find inverse 'z' transform of

i) $X(z)=\dfrac{z^2}{\left(z-\frac{1}{4}\right)^2}$ Roc: $|z|>\frac{1}{4}$

ii) $X(z)=\dfrac{1}{1-3z^{-1}+2z^{-2}}$ using convolution method. **[8]**

SECTION - II

Q7) a) Design a linear phase FIR (low pass) filter of order seven with cut-off frequency of $\dfrac{\pi}{4}$ rad/sec. Using Hanning Window. **[6]**

b) Obtain direct form I, direct form II and cascade structures for the following system. **[6]**

$y(n)=-0.1y(n-1)-0.7y(n-2)+0.7x(n)-0.2x(n-2)$.

c) Compare the performance of triangular (Bartlett) and cosine window. **[6]**

OR

Q8) a) Write a short note on Linear Phase FIR filter. **[6]**

b) Convert the analog filter with system function H (s) in to a digital IIR filter by using impulse invariance method. **[6]**

c) Explain the frequency sampling method of FIR filter design. **[6]**

Q9) a) Explain the principle of interpolation. Also derive the interpolation equation. **[8]**

b) Give the multistage approach to sampling rate conversion. Also explain the filter specifications & filter requirements for individual stages. **[8]**

OR

Q10) a) Design a two stage decimator for the following specifications,

Decimating Factor : D = 100

Passband : $0 \leq F \leq 50$

Transition band : $50 \leq F \leq 75$

Input sampling rate : 10 KHz

Ripple : $\delta_p = 10^{-1}$, $\delta_s = 10^{-3}$. **[8]**

b) For given signal $x(n) = \sin(2\pi f_0^{\,n})$ find the output of the up-sampler defined as

$$x_u(n) = x\left(\frac{n}{3}\right)$$

for 12 samples and freq. f_0 = 0.12.

Draw input and output graphically. **[8]**

Q11) a) Explain in detail hardware MAC unit for DSP. **[8]**

b) Give different addressing formats for DSP processors. **[8]**

OR

Q12) a) Compare general purpose processors and DSP processors. **[8]**

b) Explain the applications of TMS 320c 28 XX DSP for **[8]**

i) DC motor speed control.

ii) AC phase control.

iii) Proportional temperature controller.

iv) 1ϕ converter triggering.

Total No. of Questions : 12]

SEAT No. :

P1104

[Total No. of Pages : 3

[4163] - 276

T.E. (Electronics & Telecommunication)

SIGNAL CODING & ESTIMATION THEORY

(Sem. - II) (2008 Pattern)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer three questions from Section - I &three questions from Section - II.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Assume suitable data if necessary.***
5) ***Use electronic pocket calculator is allowed.***
6) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) A discrete source emits messages x_1 & x_2 with probabilities 3/4 & 1/4 with binary symmetric channels, find H (X) , H (Y), H (X,Y), H (X/Y), H (Y/X), I (X;Y) if probability p = 1/3 draw channel diagram. **[9]**

b) Determine the Lempel ziv code for the following bit stream 11101001100010110100. Recover the original sequence from the encoded stream. **[9]**

OR

Q2) a) A zero memory source emits six messages with probabilities of {0.35, 0.15, 0.15, 0.08, 0.12, 0.15} find code sequence for Huffman code, entropy of sources, average code word length, efficiency and redundancy. **[9]**

b) A zero memory source emits seven messages (N, I, e, u, U, p, n) with probabilities of {0.20, 0.15, 0.03, 0.05, 0.45, 0.08, 0.04} respectively. Find Shannon fano code, entropy of sources, average code word length, efficiency and redundancy. **[9]**

Q3) a) State information capacity theorem and Show that Shannon's limit for A WGN Channel is -1.6dB. **[8]**

P.T.O

b) The generator matrix for the (7 , 4) block code is shown below **[8]**

$$G = \begin{bmatrix} 1 & 0 & 0 & 0 & 1 & 1 & 0 \\ 0 & 1 & 0 & 0 & 0 & 1 & 1 \\ 0 & 0 & 1 & 0 & 1 & 1 & 1 \\ 0 & 0 & 0 & 1 & 1 & 0 & 1 \end{bmatrix}$$

i) Find all code words and its minimum distance.

ii) If the received code word is . {0 1 0 1 0 1 1} check for error and correct if any.

OR

Q4) a) Explain with block diagram steps in JPEG encoding and differentiate between Wavelet and JPEG. **[8]**

b) Consider a systematic (7 , 4) cyclic code with $g(x) = (x^3 + x + 1)$, the Find code words. If code word 0111010 was Send Over noisy channel producing received code word 0110010 determine the syndrome polynomial $s(x)$ and show that it is identical to error polynomial. **[8]**

Q5) a) For the convolution encoder shown in figure (1) below, construct the Code tree, and trellis diagram, find out the output of the encoder corresponding to message sequence 10111 using trellis. **[8]**

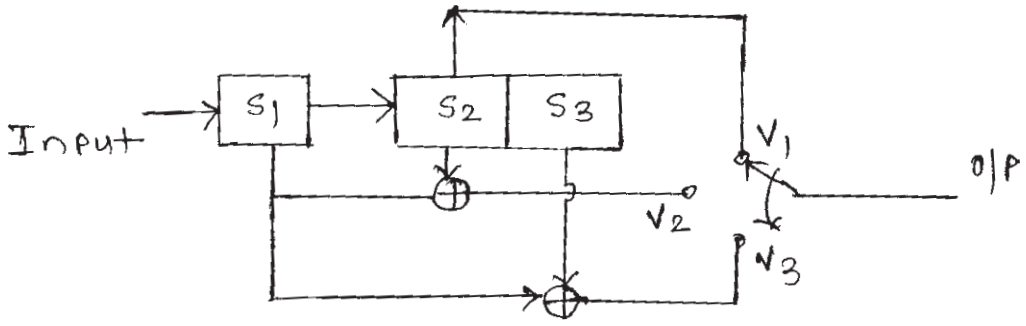


Figure (1) convolution encoder

b) Explain importance of coding gain and Ungerboecks partioning rules for 8 PSK TCM Encoding. **[8]**

OR

Q6) a) Write note on FEC and ARQ systems used in coding. **[8]**

b) For the 1/3 convolution encoder has generating vectors as g1 = (111), g2 = (100) and g3 = (101) sketch the encoder, state diagram and Trellis diagram.

Find the output data sequence for the input data sequence 01011. **[8]**

SECTION - II

Q7) a) Design a (7, 3) RS double error correcting code, find the systematic for the message $\alpha\alpha^3\alpha^5$. **[9]**

b) What is cryptography technique? Explain public key cryptography technique in detail. **[9]**

OR

Q8) a) Consider the BCH (15,5) triple error correcting code with the generator polynomial $g(x) = x^{10} + x^8 + x^5 + x^4 + x^2 + x + 1$ find the error using Gorenstein - Zierler algorithm in received polynomial $x^9 + x^6 + x^5 + x^4$. **[12]**

b) Explain in depth RSA Algorithm for encryption. **[6]**

Q9) a) Write short note on minimum variable unbiased estimator. **[8]**

b) Consider the problem where the observed samples are

Yk = M + Nk k = 1,2,3, ... k. M and Nk are statistical independent Gaussian random variables with zero mean and variance σ^2.

Find $\hat{m}_{ms}, \hat{m}_{map}$ and $\hat{m}_{mave}$. **[8]**

OR

Q10) a) Explain Kalman filter in context of estimation theory. **[8]**

b) What is Bayesian Estimation? Find the Bayesian estimation with squared error as cost function. **[8]**

Q11) a) Explain three criteria of likelihood Ratio testing. **[6]**

b) A rectangular pulse of known amplitude A is transmitted starting at time instant to with probability 1/2. The duration T of the pulse is a random variable uniformly distributed over the interval [T1, T2]. The additive noise to the pulse is white Gaussian with mean zero and variance N0/2. Determine the likelihood ratio. **[10]**

OR

Q12) a) Write a short note on Neyman pearson detector. **[8]**

b) In on-off keying system, the source transmits signal of amplitude 1 volt or 0 volt. Noise n(t) is added which has zero mean and variance = 1 and it is Gaussian. Set up the LRT (Likelihood Ratio Test) for this problem. **[8]**

Total No. of Questions : 12]

SEAT No. :

P1106

[Total No. of Pages : 2

[4163]-278
T.E. (E & TC)
COMPUTER ORGANIZATION AND ARCHITECTURE
(2008 Pattern) (Sem. - II)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answers to the two sections should be written in separate books.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Perform the following division using restoring and nonrestoring division algorithm. **[12]**

Dividend = 1100
Divisor = 0011

b) Explain IEEE single precision and double precision floating point number format. **[6]**

OR

Q2) a) Explain performance parameters of processor. **[8]**
b) Explain functional units of computer. **[6]**
c) Draw & explain the Von Neumann architecture. **[4]**

Q3) a) Draw & explain the single bus organisation. **[6]**
b) Write the control sequence for an unconditional branch instruction. **[6]**
c) Differentiate between Hardwired & Microprogrammed control. **[4]**

OR

Q4) a) Write control sequence for execution of the instruction SUB(R4), R2 using single bus organisation. **[8]**
b) Explain the steps involved in fetching a word from memory. **[8]**

Q5) a) Write short notes on (Any two) : **[12]**
i) PCI.
ii) SCSI
iii) USB
b) Explain the concept of cache memory. **[4]**

P.T.O.

OR

Q6) a) Draw and explain interface between printer and processor. **[8]**
b) Explain the different methods to handle multiple interrupt request. **[8]**

SECTION - II

Q7) a) With a neat diagram explain the architecture of 8086 processor. **[8]**
b) Describe the interrupt structure of 8086. **[8]**
c) Explain Based indexed addressing mode of 8086. **[2]**

OR

Q8) a) Write an 8086 assembly language program for BCD to seven segment code conversion. Use XLAT instruction and common cathode display. **[8]**
b) Explain the following instructions of 8086 with suitable example. **[10]**
i) TEST.
ii) LOCK.
iii) LAHF.
iv) AAA.
v) CLD.

Q9) a) Draw & explain the register model of 80386. **[8]**
b) Explain real mode of 80386. **[8]**

OR

Q10) a) Explain protection mechanism in 80386. How to change privilege level in 80386. **[8]**
b) Explain with neat diagram addressing mechanism for paging giving details of page table and page directory. **[8]**

Q11) a) Explain properties of RISC architecture. **[6]**
b) Describe register model of ARM processor. **[6]**
c) What do you mean by superscalar processor. **[4]**

OR

Q12) a) Give classification of various computer architectures and explain each. **[6]**
b) What are the difficulties in instruction pipelining. **[6]**
c) What is the role of CPSR in ARM processor. **[4]**

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Total No. of Questions : 12]

SEAT No. :

P1107

[Total No. of Pages : 2

[4163]-279
T.E. (E & TC)
INDUSTRIAL MANAGEMENT
(New) (New for the Fresh Students Only)
(Sem. - II)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any 3 questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Assume suitable data if necessary.***

SECTION - I

Q1) a) What are the functions of management? Explain steps in planning with flowchart. **[8]**

b) Discuss four major principles distinguished by F.W. Taylor in management field. **[8]**

OR

Q2) a) Compare private and public limited companies. Discuss advantages of Joint Stock Organisation. **[8]**

b) Draw organisation chart of a line and staff organisation. Give four merits & demerits. **[8]**

Q3) a) Explain the impact of each environment sector on any telecom company which you know. Draw proper table of ETOP. **[8]**

b) What are the three zones in GE matrix? Draw nine cell model for all zones. How strategy is decided in these zones. **[8]**

OR

Q4) a) What are three levels of strategy? How SBUs are effective in business, explain with proper example. **[8]**

b) Select any one type of industry carry out SWOT analysis in detail with proper table. What are its merits & demerits. **[8]**

Q5) a) Write short notes (Any two) : **[8]**

i) Ishikawa diagram.

ii) Pareto Analysis.

iii) Kaizen.

b) Explain the importance of ISO 9001:2000 quality standards in detail with proper example. **[10]**

P.T.O.

OR

Q6) a) Write short notes (Any two) : **[8]**

i) Five 'S' (5'S')

ii) TQM.

iii) Kanban.

b) Sketch goalpost view of quality and explain. Also discuss three types of quality. **[10]**

SECTION - II

Q7) a) Why both fixed and working capital are important for setting up the business? Discuss various sources of these capital in detail. **[8]**

b) Draw standard graph of Break-even Analysis and explain following terms: **[8]**

i) Fixed cost.

ii) Variable cost.

OR

Q8) a) What is the importance of Project management? Explain. **[8]**

b) What are the steps involved in preparation of PERT diagram. **[8]**

Q9) a) What are the six important steps to carry out ABC analysis. **[8]**

b) Sketch standard graph of EOQ and explain. **[8]**

OR

Q10) a) Explain two conventions used in CPM. **[8]**

i) AOA

ii) AON.

b) How HML analysis is different from ABC analysis. Compare. **[8]**

Q11) a) What is information system. Differentiate between information system & MIS. **[10]**

b) Write short notes (Any two) : **[8]**

i) ERP.

ii) Supply Chain Management.

iii) JIT.

OR

Q12) a) List different types of e-commerce. Explain C2C in detail. **[10]**

b) Write short notes (Any two) : **[8]**

i) Objectives of logistics management.

ii) Capital Budgeting.

iii) POKA-YOKE.

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Total No. of Questions : 12]

P1107 **[4163]-279** Total No. of Pages : 2

T.E. (Electronics & Telecomm Engg.)
INDUSTRIAL MANAGEMENT
(Old) (Old for the Repeater Students Only)
(Sem. - II)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer three questions from Section I and 3 questions from Section II.***
2) ***Figures to the right indicate full marks.***
3) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
4) ***Assume suitable data if necessary.***

SECTION - I

Q1) a) List out and differentiate with examples various practices followed in management theory. **[8]**

b) Define "quality" of a product and explain the importance of quality of a product in a typical buyer's market. **[8]**

OR

Q2) a) What do you mean by a term "quality management" and state the different phases of quality management. **[8]**

b) What do you understand by terms Traditional Business and Quality Business? Describe in your own words implications of paradigm defined by "Organization factor" for Traditional Business and Quality Business. Give example. **[8]**

Q3) a) What is an "economic framework" and how it affects growth of an organization in future? **[8]**

b) Explain the importance of integration of "technology development process" with "business process" for achieving business success through competitive advantage and continuity planning. **[8]**

OR

Q4) a) Explain in your own words what is Convergence Technology? In its occurrence what is the significance of exploding bandwidth? **[8]**

b) Take the case of 'telecommunications' industry and explain how it has benefitted from convergence with electronic and software industries. **[8]**

Q5) a) Explain in your own words what is Convergence Technology? In its occurrence what is the significance of rise of smart mobile devices' technology? **[8]**

b) In the context of Internetworked Business, write short notes on two of the following : **[10]**

i) Effective worker, ii) Changing Business Process,
iii) Integrated Enterprise.

P.T.O.

OR

Q6) Write Short Notes (Any 3) : **[18]**

a) Supply Chain Management.
b) Mobile Internet Technology.
c) Real-time economy.
d) Consumer power.

SECTION - II

Q7) a) List the information processing elements of the individual information origination & processing situation. **[8]**

b) Discuss in an introductory manner uncertainties in the Business Process IS View modeled as an open system view of a business process, with a simplified controls interpretation, as integral to a close loop information and control system. **[8]**

OR

Q8) a) Explain basic elements of a typical communication system and the process of transfer of a message from a source to destination. **[8]**

b) Explain with suitable diagrams, how information and resources are shared and coordinated, considering the following : **[8]**

i) Types of computer networks.
ii) Network topologies.
iii) Network strategies.

Q9) a) Compare system Integrity and system security of an information system. **[8]**

b) Explain the methodology of problem solving using system dynamics method. **[8]**

OR

Q10) a) Discuss the difference between open-loop and closed-loop system. What is the significance of "Feedback Loop" in System Dynamics methodology? **[8]**

b) Describe in your own words the General Structure of Decision Process. What do you understand by the term "Causal-Loop Diagram? What is their application? What is their importance? Explain in your own words. **[8]**

Q11) a) Explain the reasons of introduction of information integrity errors. **[8]**

b) Explain the various control points for "Data Integrity" and how we can data integrity errors using them. **[10]**

OR

Q12) a) What do you understand by the term "Cost-benefit Analysis of Information Integrity"? **[8]**

b) Explain the significance of cost-benefit analysis of business information integrity for business competitive advantage and continuity planning. **[10]**

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Total No. of Questions : 12]

SEAT No. :

P1108

[Total No. of Pages : 4

[4163]-280
T.E. (E & TC)
WAVE THEORY AND ANTENNAS
(2008 Pattern) (Sem. - II)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any 3 questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Your answers will be valued as a whole.***
6) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
7) ***Assume suitable data if necessary.***
8) ***All questions are compulsory.***

SECTION - I

Q1) a) Formulate the wave equation from Maxwell's equations. Solve it for partially conducting media. What is alternation and phase constant for the same. **[10]**

b) What is loss tangent, how media is classified as losseless dielectric, lossy dielectric and good conductor based on loss tangent. **[6]**

OR

Q2) a) In certain medium

$$\overline{E} = 10\cos(2\pi \times 10^7 t - \beta x)(\hat{a}y + \hat{a}z)\ v/m$$

If $\mu = 50\mu_0; \in = 2\in_0$ and $\sigma = 0$; Find β and $\overline{H}$. **[8]**

b) The plane wave $\overline{E} = 30\cos(wt - z)\hat{a}x\ v/m$ in air normally incident on a losseless medium $(\mu = \mu_0; \in = 4\in_0)$ at $z = 0$. (i) Find Reflection, Transmission co-efficients. Also find SWR (ii) Calculate the reflected electric and magnetic fields. **[8]**

P.T.O.

Q3) a) Write the fundamental equation for free space propagation (FRIIS Equation) and explain each parameter of it. **[5]**

b) A wave originates from the transmitting antenna with 10 dB gain and 100 watts radiating power at 10 MHz. It is received by an antenna with 15 dB gain located at 20 km distance calculate received power. **[5]**

c) Sketch the structure of atmosphere and explain each layer, significance of all. **[6]**

OR

Q4) a) Explain the mechanism of Radio wave bending by the Ionosphere with suitable diagrams and mathematical expressions. **[5]**

b) Define the terms virtual height, maximum usable frequency and their relevance in wave propagation. **[5]**

c) What are the ionospheric abnormalities and how do they effect wave propagation. **[6]**

Q5) a) Define the antenna polarization and explain linear, circular, elliptical polarization with relevant expressions and illustrative diagrams. **[9]**

b) Draw the radiation pattern of the antenna, given its radiation intensity as $U(\theta) = \cos\theta \cos 2\theta$ and also find half power and first null beam widths. Draw the radiation pattern. **[9]**

OR

Q6) a) The radiation intensity of an antenna is given by $U(\theta,\phi) = \cos^4\theta \sin^2 2\phi$ for $0 \le \theta \le \frac{\pi}{2} \& \ 0 \le \phi \le 2\pi$ (i.e upper half space) it is zero in the lower half space. Find power radiated and directivity. **[6]**

b) Explain the three field regions defined for antenna with illustrative diagram and also explain the field properties of each region. **[6]**

c) Explain the antenna parameters with the help of illustrative diagrams, relevant diagrams and mathematical expressions **[6]**

i) Antenna Efficiency.
ii) Antenna gain.
iii) Directivity.
iv) Input impedance.

SECTION - II

Q7) a) Define the current distribution for the following antenna elements. **[6]**

i) Hertzian or infinitesimal Dipole.

ii) Small Dipole.

iii) Finite Length Dipole.

b) Write the field expressions $\overline{E}, \overline{H}$ for field region for finite length dipole and also for Half Wave Dipole. **[6]**

c) From the results of Q.No. : 7(b) for the Half Wave Dipole. Find radiation intensity, Directivity, Radiation resistance of the same. **[6]**

OR

Q8) a) Sketch the radiation pattern of a Broad side linear array of 6 elements with uniform amplitude and half wave spacing. Find side lobe, Null directions. Also find amplitude levels of side lobes, HPBW, FNBW. **[9]**

b) Derive Antenna Array factor for N-element linear array taking the centre element as reference for N-is odd. Design broad side Dolph-Tschebhyscheff's Array of 5 elements with half wave spacing and with major to minor lobe to 26 dB. Find excitation co-efficients. **[9]**

Q9) a) Explain the effect of Grounding on Antenna Performance with illustrative diagrams. **[8]**

b) Sketch the current distributions and directional characteristics of grounded vertical antennas of height $\lambda/8, \lambda/4, \lambda/2$ and λ. Which of these antenna is preferred in microwave broadcasting? Discuss. **[8]**

OR

Q10) Explain the following antennas by writing structural dimensions, radiation pattern specifications, features and applications. Sketch relevant diagrams. **[16]**

i) Beverage Antenna.

ii) Ferrite Rod Antenna.

iii) Travelling wave Antenna.

iv) V-Antenna.

Q11) a) Draw a typical Rectangular microstrip antenna, what are the salient features of microstrip antenna, applications, limitations. **[8]**

b) Explain the details of Helical antenna geometry with suitable diagram also its different modes and significance of each mode. **[8]**

OR

Q12) a) Explain the principle of operation of parabolic reflector antenna with suitable diagrams. **[4]**

b) Explain the different feed techniques for parabolic reflector and their merits and demerits. **[4]**

c) A parabolic antenna having a circular mouth is to have a power gains of 1000 at $\lambda = 10$ cm. Estimate the diameter of the mouth, half power and First Null beam width of Antenna. **[4]**

d) Sketch modern version of 6-element Yagi-Uda antenna with dimensions, inter element spacings. **[4]**

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Total No. of Questions : 12]

SEAT No. :

P1109

[Total No. of Pages : 2

[4163]-281

T.E. (Instrumentation & Control)

INSTRUMENTATION FOR CHEMICAL ANALYSIS

(2008 Pattern) (Sem. - I)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any 3 questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data if necessary.***

SECTION - I

Q1) a) Draw the block diagram and explain the functions of various units used in chemical analysis. Name at least one component w.r.t. each block. **[8]**

b) With suitable diagram, explain potentiometric electroanalytical method of chemical analysis. **[8]**

OR

Q2) a) Draw & explain the experimental setup of polarography with its response curve. **[8]**

b) State advantages and disadvantages of dropping mercury electrode. **[8]**

Q3) a) State and derive the laws of photometry. Draw its typical responses. **[6]**

b) Draw the block diagram of AAS. Explain the function of each component. Explain premix burner with suitable diagram. **[12]**

OR

Q4) a) Explain double beam null type UV-VIS spectrophotometer with suitable diagram. Compare single beam & double beam instrument. **[10]**

b) Draw & explain multichannel photometer. State its advantage. **[8]**

Q5) a) With neat diagrams, explain different types of electrodes configuration that are used for atomic emissive spectrometry. **[8]**

b) Explain nondispersive IR spectrophotometry with suitable diagram. **[8]**

P.T.O.

OR

Q6) a) Explain AC and DC excitation sources used in AES with neat circuit diagrams. **[8]**

b) Explain dispersive IR spectrophotometry with suitable diagram. **[8]**

SECTION - II

Q7) a) What is chemical shift? Explain working of NMR spectrometer with neat diagram. How sensitivity can be enhanced in NMR spectrometer. **[10]**

b) Explain working of O_2 analyzer with neat diagram. **[8]**

OR

Q8) a) Compare fluorescence & phosphorescence. Explain phosphorimeter with neat diagram. **[10]**

b) Explain the analyzer for the analysis of carbon monoxide with neat diagram. State its application. **[8]**

Q9) a) Explain quadrapole mass analyzer with neat diagram. State other types of mass analyzer. **[8]**

b) Explain working of HPLC with neat diagram. **[8]**

OR

Q10) a) Draw and explain chromatogram in terms of qualitative and quantitative analysis. Explain any one detector of GC. **[10]**

b) Draw the double focussing mass analyzer and explain briefly. **[6]**

Q11) a) Explain the instrumentation for X-ray spectrometry. **[8]**

b) Explain proportional counter with suitable diagram. **[8]**

OR

Q12) a) Explain a diagram of a gas-ionization detector. **[8]**

b) What is Bragg's law? Explain X-ray diffractometer with suitable diagram. **[8]**

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Total No. of Questions : 12]

SEAT No. :

P1110

[Total No. of Pages : 2

[4163]-285
T.E. (Instrumentation & Control)
INDUSTRIAL MANAGEMENT
(2008 Pattern) (Sem. - I)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) State & explain various functions of management. Explain strategic planning and types of business strategy. **[10]**

b) Critically evaluate the importance of SWOT analysis, is it developing sustainable business strategy. **[8]**

OR

Q2) a) What is BCG matrix? Explain Parters 5 forces of competition management techniques for developing strategy. **[8]**

b) Explain following : **[10]**

i) Mind Mapping.
ii) Reverse Ishikawa diagram.

Q3) a) Explain what is quality circle? Give salient features of ISO 9000. **[8]**

b) Explain effect GAT/WTO agreement. **[8]**

OR

Q4) a) Explain with suitable example of production planning technique. **[10]**

b) State and explain the importance of supply chain management. **[6]**

Q5) a) What is ABC analysis? How it wallets the inventory to reduce cost? **[8]**

b) An automobile company uses 38000 units of a particular component per year. The ordering cost is Rs. 500 per order and inventory values. The cost per unit of the component is Rs. 20. Assuming 400 working days in a year determine :

P.T.O.

i) EOQ.
ii) No. of orders/year.
iii) Inventory cycle.
iv) Total inventory cost. **[8]**

OR

Q6) Write short notes on : **[16]**

a) Raw materials storage & handling.
b) Purchase & Inventory Management.

SECTION - II

Q7) a) Define Motivation. Explain Maslow's theory of motivation. **[10]**

b) State & explain various methods of training how it influences productivity? **[8]**

OR

Q8) Explain following : **[18]**

a) Leadership skill.
b) Man power planning.

Q9) a) Explain the procedure of preparing project report and brief out about project costing? **[10]**

b) Explain the followings: **[6]**

i) Pay back Period.
ii) Earning on Shares.

OR

Q10) a) Explain with suitable example types of capitals. **[10]**

b) Differentiate between CPM and PERT. **[6]**

Q11) a) State and explain the concept of disaster management. **[6]**

b) Explain in detail disaster management causes, effects, mitigation mechanism & the impact on global warming. **[10]**

OR

Q12) a) Explain safety and Environmental norms (ISO 14000) global warming. **[10]**

b) Explain about permanent Account Number. **[6]**

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Total No. of Questions : 12]

SEAT No. :

P1111

[Total No. of Pages : 3

[4163]-288
T.E. (Instrumentation & Control)
PROCESS LOOP COMPONENTS
(2008 Pattern) (Sem. - II)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answers to the two sections should be written in separate books.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) "Process Signals are Standardized" Justify. Why zero is shifted in a standard signal. Classify with proper justification the location of the following process instruments and draw respective P & ID symbols. **[12]**

i) Pressure Gauge.
ii) Programmable Logic Controller.
iii) Alarm Annunciator.
iv) Current to Pressure converter.
v) Temperature Element.

b) A temperature range of 20ºC to 120ºC is linearly represented by a standard current range of 4 to 20 mA. What current will result from 66ºC? What temperature does 6.5 mA represent? **[6]**

OR

Q2) a) Explain the following with respect to DPT. **[8]**

i) Manifold.
ii) Mounting/installation for liquid, gas & steam service.

b) A sensor outputs a voltage ranging from 20 to 250 mV. Develop the required signal conditioning to get output 0 to 5V. The circuit must have very high input impedance. **[10]**

P.T.O.

Q3) a) Define the following : **[8]**

i) Process load.
ii) Integral time.
iii) Proportional band.
iv) Neutral Zone/Differential Gap.

b) Compare Proportional, Integral and Derivative control actions. **[8]**

OR

Q4) a) Suggest with proper justification control actions for pressure, flow & temperature loops. **[6]**

b) Explain the following concepts with respect to controller. **[10]**

i) Bumpless transfer.
ii) Rate before reset.

Q5) a) Explain with neat figure working of current to pneumatic converter. **[8]**

b) Compare Process Reaction Curve method with Ziegler Nichols method of tuning. **[8]**

OR

Q6) a) What are the drawbacks of a relay based system. **[8]**

b) Explain algorithms used in a digital controller. **[8]**

SECTION - II

Q7) a) List various functions of an input module of Programmable Logic Controller. Draw wiring diagram of a Digital Input Module. **[8]**

b) A pump is to be used to fill two storage tanks. The pump is manually started by the operator from Start/Stop station. When 1st tank is full, stop flow to 1st tank & direct it to 2nd tank. When 2nd tank is full switch off the pump. Draw the process diagram and develop relay ladder diagram for the given application. **[10]**

OR

Q8) a) What are different types of Timers? Explain using timing diagram. **[8]**

b) Develop relay ladder diagram for the following application.

A motorized overhead garage door is to be operated automatically to open and closed position. Red light indicates closed position. Green light denoted open position and yellow light for indicating the intermediate position. **[10]**

Q9) a) Explain different selection criteria for control valve. **[8]**

b) Explain any two important control valve accessories. **[8]**

OR

Q10) a) Compare Spring and Diaphragm Actuator with Piston Cylinder Actuator of control valve. **[8]**

b) Explain the working and features of Diaphragm Valve. **[8]**

Q11) a) Explain the effects of Cavitation and Flashing. Explain the remedial measures for Cavitation and Flashing. **[8]**

b) A valve is to be designed for pressure control application with the following service data. **[8]**

i) Service: Gas
ii) Line pressure: 60 psi
iii) Outlet pressure: 28 psi
iv) Temperature: 440°F
v) Specific gravity: 1
vi) Flow: 10000 scfh.

OR

Q12) a) What are different sources of noise in a control valve? Compare source and path treatment methods for noise reduction. **[8]**

b) Comment on the valves used for High Pressure and High temperature services with reference to their applicability. **[8]**

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Total No. of Questions : 12]

SEAT No. :

P1112

[Total No. of Pages : 4

[4163]-290
T.E. (Instrumentation & Control)
CONTROL SYSTEM DESIGN
(2008 Pattern) (Sem. - II)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer 3 questions from Section - I and 3 questions from Section - II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) List the various types of compensators. Explain the series compensators with respect to the following points. **[16]**

a) Pole-zero location.
b) Its effect on root locus.
c) Its effect on transient and steady state response.

OR

Q2) The forward path transfer function of a unity feedback control system is

$$G(s)H(s)=\frac{100}{s(s+9)}$$

It is desire to have peak overshoot as 9% and natural frequency of oscillation 10 rad/sec. Design a suitable compensator. **[16]**

Q3) The open loop transfer function of a unity feedback control system is

$$G(s)H(s)=\frac{2000K}{s(s+10)}$$

It is desired that e_{ss} = 1% for unit ramp input and phase margin $\geq 45°$. Determine the parameters of a phase lead compensator to be used for this purpose. **[16]**

OR

P.T.O.

Q4) Design a phase lag compensation for a feedback control system having following open loop transfer function.

$$G(s)H(s)=\frac{K}{s(1+0.005s)(1+0.001s)}$$

to have K_v = 800 sec^{-1} and phase margin around 40°. **[16]**

Q5) The following results are observed while performing a open loop step test experiment on a process:

a) Process gain is 2.

b) Process dead time is 2.5 sec.

c) Process time constant is 24 sec.

Find the parameters for P, PI and PID using Cohen-Coon method. **[18]**

OR

Q6) The transfer function of unity feedback system is given below :

$$G(s)=\frac{K}{s(s+2)(s+4)}$$

Find the parameters for P, PI and PID using Ziegler-Nicholas Method. **[18]**

SECTION - II

Q7) a) Design a PD controller such that the dominant roots of the characteristic equation is located at $s = -1.2 + j1.2$ in s-plane. The feedback control system has unity feedback and the forward path transfer function is

$$G(s)=\frac{30}{s(s+1)(s+3)}$$ **[10]**

b) Design a controller for the following first order system:

$$G_p(s)=\frac{K_p}{(\tau_p s+1)}$$

Using the direct synthesis approach, and given that the desired closed-loop behavior is :

$$G_{CL}=\frac{1}{(\lambda s+1)}$$ **[8]**

OR

Q8) a) Design a PI controller having given unity feedback forward path transfer function as

$$G(s)=\frac{150}{(s+1)(s+5)}$$

such that P.M = 35° at ω = 8 rad/sec. **[8]**

b) Design a controller for the following first order system :

$$G_p(s)=\frac{1e^{-3s}}{(10s+1)}$$

Using the direct synthesis approach, and given that the desired closed-loop behavior is :

$$Q(s)=\frac{1e^{-3s}}{(7s+1)}$$

[Use first order Taylor series approximation for approximation of delay time] **[10]**

Q9) a) State and explain concept of controllability. Determine the state controllability of the system.

$$\begin{bmatrix}\dot{x}_1\\ \dot{x}_2\\ \dot{x}_3\end{bmatrix}=\begin{bmatrix}1 & 0 & 0\\ 0 & 2 & 0\\ 0 & 2 & 1\end{bmatrix}\begin{bmatrix}x_1\\ x_2\\ x_3\end{bmatrix}+\begin{bmatrix}0 & 1\\ 1 & 0\\ 0 & 1\end{bmatrix}u$$ **[8]**

b) State and explain concept of observability. Determine the state observability of the system.

$$\begin{bmatrix}\dot{x}_1\\ \dot{x}_2\\ \dot{x}_3\end{bmatrix}=\begin{bmatrix}1 & 0 & 0\\ 0 & 2 & 0\\ 0 & 2 & 1\end{bmatrix}\begin{bmatrix}x_1\\ x_2\\ x_3\end{bmatrix}+\begin{bmatrix}0 & 1\\ 1 & 0\\ 0 & 1\end{bmatrix}u$$

$$\begin{bmatrix}y_1\\ y_2\end{bmatrix}=\begin{bmatrix}1 & 0 & 0\\ 0 & 1 & 0\end{bmatrix}\begin{bmatrix}x_1\\ x_2\\ x_3\end{bmatrix}$$ **[8]**

OR

Q10) Determine the output time response for the state model.

$$A=\begin{bmatrix} 0 & 1 \\ -6 & -5 \end{bmatrix}, B=\begin{bmatrix} 0 \\ 1 \end{bmatrix} \text{ and } C=\begin{bmatrix} 6 & 1 \end{bmatrix}$$

$u = 1$ for $t \geq 0$ and $\quad x(0)=\begin{bmatrix} 1 \\ 0 \end{bmatrix}$ **[16]**

Q11) Consider a system with state space model

$$\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \\ \dot{x}_3 \end{bmatrix}=\begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ -8 & -14 & -7 \end{bmatrix}\begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix}+\begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix}u$$

Design a state feedback controller using Ackerman's formula such that closed-loop poles are at $s_1 = -5$, $s_2 = -6$, $s_3 = -7$. **[16]**

OR

Q12) A control system represented by the following state and output equations

$$\dot{x}_1 = -4x_1 + x_2$$

$$\dot{x}_2 = -5x_2 + u$$

and $y = x_1$

Design observer gain vector such that observer poles are located at $s_1 = -10$ and $s_2 = -20$. [Use coefficient comparison method] **[16]**

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Total No. of Questions : 12]

SEAT No. :

P1113

[Total No. of Pages : 2

[4163]-292

T.E. (Printing)

PRINTING NETWORK TECHNOLOGY AND OPTO–ELECTRONICS

(2008 Pattern) (Sem. - I)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer 3 questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain data encryption and decryption techniques in details. **[10]**

b) Explain role of optoelectronics in Printing Technology. **[8]**

OR

Q2) a) Draw and explain block diagram of communication system. Explain necessity of modulation. **[10]**

b) Explain FDM (frequency division multiplexing) with suitable diagram. **[8]**

Q3) a) Explain basic fiber optic communication system. **[8]**

b) Explain any one application of optical communication in the field of printing. **[8]**

OR

Q4) a) Explain basic principle and characteristics of fiber optic cable. **[8]**

b) Explain any four types of losses in fiber optic cable. **[8]**

Q5) a) Explain different types of RFID tags. **[8]**

b) Explain sheet thickness measurement application. **[8]**

OR

Q6) a) Explain Wi-Fi technology. **[8]**

b) Explain working of Laser printer with suitable diagram. **[8]**

P.T.O.

SECTION - II

Q7) a) Explain different types of operating system (OS). **[10]**

b) Explain any four UNIX commands. **[8]**

OR

Q8) Write short notes on (Any three) : **[18]**

a) MAC operating system.
b) Design issues of operating system.
c) Windows NT.
d) Directory structure of UNIX.

Q9) Explain following protocols in details (Any four) : **[16]**

a) FTP
b) SMTP
c) POP3
d) ICMP
e) IMAP

OR

Q10) a) Explain different topologies of Local Area Network (LAN) with diagram. **[8]**

b) Explain layered structure of network operating system. **[8]**

Q11) Write short notes on following internet working devices (Any four) : **[16]**

a) Repeaters
b) Hubs
c) Switches
d) Gateways
e) Bridges

OR

Q12) a) Explain concept of leased lines and explain ISDN. **[8]**

b) Explain VSAT and VPN with suitable diagram. **[8]**

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Total No. of Questions : 12]

SEAT No. :

P1114

[Total No. of Pages : 4

[4163]-294

T.E. (Printing)

DESIGN OF PRINTING MACHINE COMPONENTS

(2008 Pattern) (Sem. - I)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***Assume suitable data, if necessary.***

SECTION - I

Unit - I

Q1) a) What are the factors considered while selecting a material? **[8]**

b) What is Service factor? Factor of safety and margin of safety? Explain the significance of each. Also explain the difference between service factor and factor of safety? **[10]**

OR

Q2) a) A shaft supported on two bearings at the ends carries the load of 10,000N at the middle of the shaft. The length of the shaft is 150 mm. The power is transmitted to the shaft by gear drive. The power transmitted is 10kW at 1440 rpm. The material used for shaft has ultimate strength of 620 N/mm^2 and yield strength 480 N/mm^2. The factor of safety = 1.5. Design the shaft using ASME code. **[10]**

b) Explain 'Creativity' in design. **[4]**

c) Explain BIS system of designation of steel. **[4]**

Unit - II

Q3) a) Draw a neat sketch of cotter joint and also explain design of cotter joint. **[8]**

b) Design knuckle joint to connect two circular rod, subjected to an axial to tensile load of 50 kN. Select suitable material and properties for its parts. Design the joint and specify the dimensions of its components. **[8]**

OR

P.T.O.

Q4) a) State the procedure of designing a shaft as per the following approaches. **[8]**

i) Equivalent bending moment approach.
ii) Rigidity Approach.

b) Write a note on tolerances. What are the different types of tolerances? Show now such tolerances are given to machine component. **[8]**

Unit - III

Q5) Two 35 mm shafts of printing machine are connected by a flange coupling. The flanges are fitted with 6 bolts on 125 mm bolt circle. The shaft transmits a torque of 800 N-m at 350 rpm. Calculate : **[16]**

a) Diameter of bolt.
b) Thickness of flanges.
c) Key dimensions.
d) Power transmitted.
e) Hub length.

OR

Q6) a) What are the differences between the properties of brittle and ductile material? **[8]**

b) Explain important factors in selecting a coupling. **[8]**

SECTION - II

Unit - IV

Q7) a) Discuss construction and applications of re-circulating ball screws. **[4]**

b) Single start lead screw of a lathe machine has ACME threads of 60 mm outside diameter and 8 mm pitch. It supplies drive to a tool carriage which needs an axial force of 2000 N. A collar bearing with inner and outer diameter as 60 mm and 120 mm respectively is provided. The coefficient of friction for the screw threads is 0.12 and for collar it is 0.1. Determine the power required to drive the screw if it is rotating at 30 rpm. Also find efficiency of the screw and overall efficiency assuming uniform pressure condition. **[14]**

OR

Q8) A sluice gate, used in water pipe lines consist of a gate which is raised by a spindle which is operated by a lever of length 300 mm. Assuming following data and uniform wear theory for design find **[18]**

a) Torque required to raise the gate
b) Force applied at the wheel
c) Overall Efficiency

Data

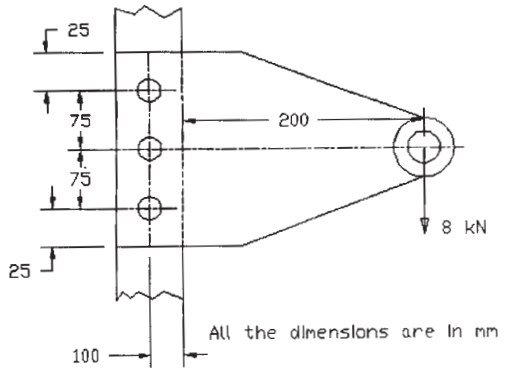
Threads on spindle sq 36 × 6
Collar inner and outer diameter 32 mm and 50 mm respectively
Coefficient of friction for threads = 0.12
Coefficient of friction for collar = 0.18
Mass of the gate = 765 kg.
Frictional resistance to the gate due to water pressure = 2.75 kN.

Assuming uniform pressure theory for the design calculate the torque required to lower the gate.

Unit - V

Q9) a) Discuss the resultant load developed in preloaded bolts subjected to external tension. **[4]**

b) A steel plate is subjected to a force of 8kN is fixed to a channel by means of three identical bolts as shown in the figure. The bolts are made of steel having yield strength of 380 MPa. **[12]**

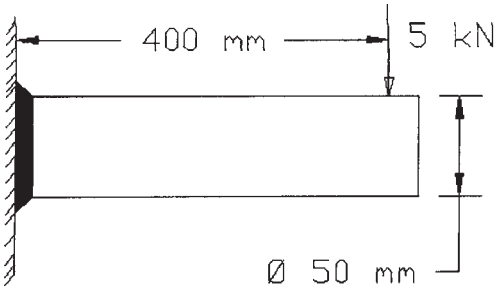


Assuming factor of safety as 2.5 determine the size of the bolts required. Assume d = dc/0.84

OR

Q10) a) Discuss the advantages and limitations of the welded joints. **[4]**

b) A circular bar of 50 mm diameter is welded to a steel plate by an annular fillet weld as shown in the figure. A force of 5 kN is applied on the bar at a distance of 400 mm from the plane of the weld. If the allowable shear stress in the weld material is 94 N/mm^2. Determine the size of the weld. **[12]**



Unit - VI

Q11) a) Discuss the significance of the Wahl's Factor. **[3]**

b) For a composite spring subjected to a load of 17855 N and if outer spring is 17 mm longer than the inner spring, find stresses developed inside both the springs using following data. **[13]**

	Outer Spring	Inner Spring
Mean coil diameter (mm)	105	35
Wire diameter (mm)	15	5
Active turns	08	20
Modulus of rigidity (MPa)	81340	81340

OR

Q12) a) Discuss the nature of stresses for Helical Torsion Springs. **[3]**

b) For a valve spring of an IC Engine using following data design the spring. **[13]**

Spring Load when valve is closed = 215 N
Spring Load when valve is open = 315 N
Inside guide bush diameter for the spring = 20 mm
Outside recess diameter = 80 mm valve lift = 4mm
For Spring material ultimate strength = 825 MPa
Modulus of rigidity 88850 MPa
End style: Squared and ground
Permissible shear strength = 45% the ultimate tensile strength

Assume 20% additional working deflection is provided to avoid complete closing of spring.

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Total No. of Questions : 12]

SEAT No. :

P1115

[Total No. of Pages : 4

[4163]-300

T.E. (Printing Engg.)

THEORY OF PRINTING MACHINES & MACHINE DESIGN

(2008 Pattern) (Sem. - II)

Time :4 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer 3 questions from Section I and 3 questions from Section II.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Figures to the right indicate full marks.***
4) ***Use of electronics pocket calculator is allowed.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What do you mean by pitch point, circular pitch, module, addendum, dedendum and pressure angle of a gear? What is the relation between circular pitch, diameter of pitch circle and number of teeth? **[8]**

b) Two gears wheels mesh externally and are to give a velocity ratio of 3 to 1. The teeth are of involute form; module m = 6 mm, addendum = 1 m, pressure angle = 20°, the pinion rotates at 90 rpm, Find **[10]**

i) No. of teeth on pinion to avoid interference on I and the corresponding number on the wheel.
ii) The length of path of contact.
iii) The length of arc of contact.
iv) The number of pairs of teeth in contact.
v) The maximum velocity of sliding.

OR

Q2) a) Derive an expression for the length of path of contact in a pair of meshed spur gear. **[12]**

b) Give the comparison between involute and cycloidal profile teeth. **[6]**

Q3) a) Explain the working of epicyclic gear train with sketch. Give its applications. **[8]**

P.T.O.

b) A compound gear train consist of four gears. The number of teeth on gears A, B, C and D are 54, 75, 36 and 81 respectively. The gears B and C forms a compound gear. If the gear A transmits 9 KW power at 200 rpm and the train efficiency is 80% calculate the torque on the output shaft D. **[8]**

OR

Q4) a) The arm of an epicyclic gear train rotates at 100 rpm in the anticlockwise direction. The arm carries two wheels A and B having 36 and 45 teeth respectively. The wheel A is fixed and the arm rotates about the centre of the wheel A. Find the speed of wheel B. What will be the speed of B, if the wheel A instead of being fixed, makes 200 rpm clockwise? Solve by tabular method. **[8]**

b) Explain the procedure for obtaining the velocity ratio of epicyclic gear train by tabular method. **[8]**

Q5) Draw the profile of a cam operating a knife-edge follower when the axis of the follower passes through the axis of the cam shaft, from the following data : **[16]**

a) Follower to move outwards through 40 mm during 60° of cam rotation,

b) Follower to dwell for the next 45°.

c) Follower to return to its original position during the next 90°.

d) Follower to dwell for the rest of the cam rotation.

The displacement of the follower is to take place with simple harmonic motion during outstroke and uniform acceleration and retardation during the return strokes. The least radius of cam is 50 mm. If the cam rotates at 400 rpm, determine the maximum velocity and acceleration of the following during the outward stroke and return stroke.

OR

Q6) a) Derive relation for the displacement, velocity and acceleration of a follower which has simple harmonic motion during rise and return. Also draw the displacement, velocity and acceleration diagram with respect to the cam rotation. **[8]**

b) A flat face follower is operated by a uniformly rotating cam. The follower is raised through a distance of 25 mm in 120° rotation of cam, remains in rest for the next 30° and lowered through further 120° rotation of cam. The raising and lowering both takes place with SHM. The least radius of cam is 25 mm. Draw the cam profile. **[8]**

SECTION - II

Q7) a) A transmission shaft of cold drawn steel 27 Mn2 (Sut = 510 N/mm^2 and Syt = 320 N/mm^2) is subjected to a fluctuating torque which varies from – 100 N-mm to + 400 N-mm. The factor of safety is 2 and the expected reliability is 90%. Neglecting the effect of stress concentration, determine the diameter of the shaft. Take $K_a = 0.8$, $K_b = 0.85$, $K_c = 0.897$.

Assume the distortion energy theory of failure. **[8]**

b) What is Stress concentration? What are its causes and explain the methods of reducing stress concentration. **[8]**

OR

Q8) a) Explain the terms with neat sketches : **[8]**

i) Soderberg diagram.
ii) Goodman diagram.
iii) Modified Goodman diagram.

b) Explain the effect of following modifying factors on endurance strength: **[8]**

i) Surface finish factor.
ii) Size factor.
iii) Reliability factor.
iv) Modifying factor to account stress concentration.

Q9) It is required to design a pair of spur gears with 20º full-depth involute teeth based on the Lewis equation. The velocity factor is to be used to account for dynamic load. The pinion shaft is connected to a 10 KW, 1440 rpm motor. The starting torque of motor is 150% of the rated torque. The speed reduction is 4:1. The pinion as well as the gear is made of plain steel 40C8 (Sut = 600 N/mm^2). The factor of safety can be taken as 1.5. Design the gears, specify their dimensions and suggest suitable surface hardness for the gears.

Take minimum number of teeth 18.
Levis form factor for 18 teeth = 0.308.

Assume a trial value for the pitch line velocity as 5 m/s.
b = 10 m.

First choice of std. modules in mm recommended by ISO:
1, 1.25, 1.5, 2, 2.5, 3, 4, 5, 6, 8, 10, 12, 16, 20, 25, 32, 40.
$K = 0.16\ [BHN/100]^2$ **[18]**

OR

Q10) a) What is the relationship between actual and virtual number of teeth and the helix angle. **[8]**

b) A pair of parallel helical gears consist of 18 teeth pinion meshing with a 63 teeth gear. The normal module is 3 mm. The helix angle is 23° while the normal pressure angle is 20°. Calculate **[10]**

i) The transverse module.
ii) The transverse pressure angle.
iii) The axial pitch.

Q11) a) A ball bearing is operating on a work cycle consisting of three parts – a radial load of 3000 N at 1440 rpm for one quarter cycle, a radial load of 5000 N at 720 rpm for one half cycle and radial load of 2500 N at 1440 rpm for the remaining cycle. The expected life of bearing is 10000 h. Calculate the dynamic load carrying capacity of the bearing. **[12]**

b) Define static and dynamic load carrying capacity of rolling contact bearing. **[4]**

OR

Q12) a) Describe with neat sketches, the different kinds of rolling contact bearings. **[8]**

b) A deep-groove ball bearing having bore diameter of 60 mm and rotating at 1440 rpm is subjected to a radial force of 2500 N and an axial force of 1200 N. The radial and thrust factors are 0.56 and 2.0 respectively. The load factor is 1.2. If the expected rating life is 10000 hours, calculate the required basic dynamic capacity of the bearing. **[8]**

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Total No. of Questions : 12]

SEAT No. :

P1117

[Total No. of Pages : 2

[4163]-303

T.E. (Chemical)

INDUSTRIAL ORGANIZATION AND MANAGEMENT

(2008 Pattern) (Sem. - I)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer three questions from Section I and three questions from Section II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain management with its functions. **[10]**

b) What do you mean by decision making? Explain with the help of characteristics and classification. **[8]**

OR

Q2) a) Explain in detail organization with its types. **[10]**

b) Explain the concept of Management by Objectives. **[8]**

Q3) a) Explain the importance of job evaluation with its methods. **[8]**

b) Define recruitment. Discuss various sources of recruitment. **[8]**

OR

Q4) a) What do you mean by motivation? Explain the importance of motivation in industry prospective. **[8]**

b) Explain the following : **[8]**

i) Strike.
ii) Gherao.

Q5) a) Explain the importance of inventory control and methods of exercising it. **[8]**

b) Explain the functions of material manager in industry. **[8]**

P.T.O.

OR

Q6) a) Explain the procedure of purchase through quotations and comparatives. **[8]**

b) Explain in detail Material Management with its functions. **[8]**

SECTION - II

Q7) a) Differentiate between marketing and selling. **[10]**

b) Explain in detail marketing research. **[8]**

OR

Q8) a) Write a short note on : **[10]**

i) Sales forecasting.
ii) Advertising.

b) Define price skimming with minimum 5 advantages. **[8]**

Q9) a) Explain the factors affecting international trade. **[8]**

b) Explain the procedure for importing goods. **[8]**

OR

Q10) a) Explain in detail Quality Circle (QC) with essentials for successful QC. **[8]**

b) Write a short note on (Any two) : **[8]**

i) VAT.
ii) MODVAT.
iii) Patent.

Q11) a) List out the types of contracts or classification of contracts. **[6]**

b) Explain the features and provisions in MRTP Act. **[10]**

OR

Q12) a) Define work study. Explain the objectives and procedure of work study. **[8]**

b) Explain :

i) Flow diagram.
ii) String Diagram. **[8]**

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Total No. of Questions : 12]

SEAT No. :

P1118

[Total No. of Pages : 2

[4163]-304
T.E. (Chemical)
CHEMICAL PROCESS TECHNOLOGY
(2008 Pattern) (Sem. - I)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any 3 questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) Describe the process for manufacturing NaOH & Cl_2 with reaction details. **[10]**

b) Explain production of metallic Mg. **[6]**

OR

Q2) a) Discuss the recovery of various salt compounds obtained from sea water. **[8]**

b) Describe Solvay Process. **[8]**

Q3) a) Explain production of nitric acid. **[8]**

b) Describe the manufacturing of phosphates. **[10]**

OR

Q4) a) Describe contact process in detail for production of sulphuric acid and compare it with chamber process. **[10]**

b) Discuss the manufacturing process of phospheric acid. **[8]**

Q5) a) Explain sugar production with refining details. **[8]**

b) Discuss sulphite pulping process. **[8]**

OR

Q6) a) Explain production of dextrin. **[6]**

b) Describe production process of ethanol and absolute alcohol. **[10]**

P.T.O.

SECTION - II

Q7) a) Describe production of soap and glycerine. **[8]**

b) Explain penicilline production. **[8]**

OR

Q8) a) Discuss extraction process for oil recovery. **[8]**

b) Describe coking of coal. **[8]**

Q9) a) Write a short note on - refinery operations. **[8]**

b) Explain water gas and natural gas production. **[8]**

OR

Q10) Describe in detail (any two) : **[16]**

a) Alkylation.

b) Thermal cracking.

c) Polymerization.

d) Hydrodealkylation.

Q11) Draw PFD and explain in brief (Any 3) : **[18]**

a) Styrene production.

b) Ethylene Dichloride production.

c) Methanol production.

d) IPA production.

OR

Q12) a) Describe production of phenol by using cumene. **[10]**

b) Discuss production of halogenated hydrocarbons. **[8]**

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Total No. of Questions : 12]

SEAT No. :

P1119

[Total No. of Pages : 4

[4163]-305

T.E. (Chemical)

CHEMICAL ENGINEERING THERMODYNAMICS - II

(2008 Pattern) (Sem. - I)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer three questions from Section I and three questions from Section II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain tangent intercept method for the determination of partial molar properties . **[8]**

b) Prove the alternative definition of chemical potential that **[8]**

$$\mu_i = \left(\partial E / \partial ni\right) s, v, nj$$

OR

Q2) a) What is Poynting factor? Derive the equation for finding the fugacity of a pure liquid. **[8]**

b) The volume of an aqueous solution of NaCl at 298 K was measured for a series of molalities (moles of solute per kg of solvent) and it was found that the volume varies with molality according to the following expression

$$V = 1.003\times10^{-3} + 0.1662\times10^{-4} m + 0.177\times10^{-5} m^{1.5} + 0.12\times10^{-6} m^2$$

where m is the molality and V is in m^3. Calculate the partial molar volumes of the components at m = 0.1 mol/kg. **[8]**

Q3) a) The excess Gibbs energy of a binary mixture at T and P is given by

$$\frac{GE}{RT} = -3x_1x_2(0.4x_1 + 0.5x_2)$$

Find expressions for x_1 and x_2. **[10]**

P.T.O.

b) The Van Laar constants A and B for the system ethanol (1) and benzene (2) at 50ºC are 1.7910 and 1.8262 respectively. Calculate the activity coefficients of the components in a solution containing 60 mol % ethanol. **[8]**

OR

Q4) a) For a binary mixture of A and B, activity coefficient data for A is available over the entire composition range, while only one point data is available for B. Show how you would determine activity coefficient for B over the entire range of composition. **[8]**

b) The enthalpy of a binary liquid mixture containing components 1 and 2 at 298 K and 1 bar is given by **[10]**

$H = 400x_1 + 600x_2 + x_1x_2\,(40x_1 + 4x_2)$

Where H is in J/mol. Determine

i) Pure component enthalpies

ii) Partial molar enthalpies

Q5) For a chlorobutane (1)/chlorobenzene (2) mixture prepare P–*x*–*y* diagram at 363 K and T–*x*–*y* diagram at 90 kPa. The antoine constants are given as follows. **[16]**

	A	B	C
Chlorobutane	13.9600	2826.26	–49.05
Chlorobenzene	13.9926	3295.12	–55.60

OR

Q6) a) A liquid mixture of cyclohexane (1) and phenol (2) for which $x_1 = 0.60$ is in equilibrium with its vapor at 417 K. Determine the equilibrium pressure P and vapor composition y_1 from the following information. **[10]**

$\ln x_1 = Ax_2^2$, $\ln x_2 = Ax_1^2$, $P_1^{sat} = 1.24\,\text{bar}$, $P_2^{sat} = 0.89\,\text{bar}$. The system forms an Azeotrope at 417K for which $x_1^{az} = y_1^{az} = 0.294$.

b) Explain the effect of pressure on T–*x*–*y* diagram. **[6]**

SECTION - II

Q7) a) Explain liquid-liquid equilibrium diagram for system in which two pairs are partially soluble. **[7]**

b) The following results were obtained by experimental VLE measurements on the system ethanol (1) and benzene (2) at 101.3 kPa. Test whether the data are thermodynamically consistent or not. **[9]**

x_1	0.003	0.449	0.700	0.900
y_1	0.432	0.449	0.520	0.719
P_1^s, kPa	65.31	63.98	66.64	81.31
P_2^s, kPa	68.64	68.64	69.31	72.24

OR

Q8) a) For a liquid equilibrium in a binary system at uniform T and P show that $(1-x_1^{\alpha})x_2^{\alpha} = (1-x_1^{\beta})x_2^{\beta}$. **[8]**

b) Derive various criteria for phase equilibrium. **[8]**

Q9) a) Derive the relationship between mole fractions of species in multiple reactions and the extent of reactions. **[9]**

b) Solid calcium oxalate dissociates at high temperatures into solid calcium carbonate and carbon monoxide. **[9]**

$$CaC_2O_4(s) \rightarrow CaCO_3(s) + CO(g)$$

The equilibrium pressure of CO between 670 and 700 K is given by ln P = 14.4 – (9600/T), where P is in atm and T is in K. Assuming ideal behavior calculate ΔG^o, ΔH^o and ΔS^o at 675 K.

OR

Q10) a) Determine the degrees of freedom F for each of the following systems.

i) A system of two miscible nonreacting species which exist as an Azeotrope in VLE.

ii) A system prepared by partially decomposing $CaCO_3$ into an evacuated space.

iii) A system prepared by partially decomposing NH_4Cl into an evacuated space. **[6]**

b) Industrial methanol is produced according to the reaction

$CO(g) + 2H_2(g) \rightarrow CH_3OH(g)$. **[12]**

Calculate standard free energy change equilibrium constant at 500K from the following data.

$$\Delta G^o{}_{298} = -24.454 kJ.\ \Delta H^o{}_{298} = -90.128 kJ$$

Constants in the heat capacity equation are given as follows.

Compound	a	$b\times10^3$	$c\times10^6$	$d\times10^9$	$e\times10^{-5}$
CO	28.068	4.631	–	–	–0.258
H_2	27.012	3.509	–	–	0.690
CH_3OH	18.382	101.564	–28.683	–	–

Q11) a) In the synthesis of methanol from CO and H_2(g) at 600 K and 5 bar estimate the degree of conversion of CO if the reactor is fed with a mixture of CO, H_2 and CH_3OH in the mole ratio 1:2: 0.02. The equilibrium constant at 600 K is 4.973×10^{-3}. **[9]**

b) Ethanol can be prepared by the following reaction

$$C_2H_4(g) + H_2O \rightleftarrows C_2H_5OH(g)$$

At 1 atm and 125ºC, $\Delta G^o = 5040J$. Calculate the conversion obtained if an isothermal reactor operating at 125ºC and 2 atm is fed with a mixture containing 50 mol% ethylene and 50 mol% steam. Assume that the equilibrium is reached at the exit of the reactor and the gases behave ideally. **[7]**

OR

Q12) a) Ethanol can be produced according to reaction

$$C_2H_4(g) + H_2O(g) \rightarrow C_2H_5OH(g)$$

If an equimolar mixture of ethylene and water vapor is fed to a reactor which is maintained at 1000 K and 1 bar determine the degree of conversion and the composition of reaction mixture at equilibrium, assuming that the reaction mixture behaves like an ideal gas. At 1000 K, K = 1.639. **[8]**

b) A stoichiometric mixture of $N_2(g)$ and $H_2(g)$ at 100 bar and 800K enter a catalytic reactor for the synthesis of ammonia. Assuming that the gas phase is ideal, estimate the degree of conversion and the equilibrium composition. The equilibrium constant at 800 K for the reaction is 1.122×10^{-5}. **[8]**

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Total No. of Questions : 12]

SEAT No. :

P1120

[Total No. of Pages : 7

[4163]-306

T.E. (Chemical)

CHEMICAL REACTION ENGINEERING - I

(2008 Pattern) (Sem. - II)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answers to the two sections should be written in separate books.***

2) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***

3) ***Assume suitable data if necessary.***

SECTION - I

Q1) a) The decomposition of acetal dehyde : **[6]**

$CH_3CHO \rightarrow CH_3 + CO$ is a 2nd order reaction. The rate at a certain temperature is 0.18 mol/lit. sec. when concentration of CH_3CHO is 0.1 mol/lit.

i) What is rate expression for this reaction?

ii) What is the value of rate constant?

iii) Calculate the rate of reaction when concentration of CH_3CHO is 0.2 mol/lit.

b) Explain kinetic model for non-elementary reaction. **[6]**

c) Explain rate of reaction and give the various ways of expressing the reaction rate. **[6]**

OR

P.T.O.

Q2) a) Experiments shows that reaction between $H_2(g)$ & $I_2(g)$ to produce HI(g) proceeds with a rate.

$$\frac{1}{2}\frac{d[HI]}{dt} = K[H_2][I_2]$$

Suggest two step mechanism which is consistant with this rate. **[6]**

b) Define the following term: **[6]**

i) Rate constant.

ii) Elementary reaction.

iii) Order of reaction.

c) A certain reaction has a rate given by **[6]**

$-r_A = 0.2C_A^2$, mol/lit. hr

Calculate :

i) Unit of rate constant.

ii) If concentration is expressed in mol/cm^3 and time in minute, what would be the value and unit of rate constant?

Q3) a) Show that

$$C_A^{1-n} - C_{AO}^{1-n} = K(n-1) + \ldots\ldots\ldots n \neq 1$$ **[4]**

b) Explain integral method of analysis in detail. **[4]**

c) In a homogeneous isothermal liquid polymerization, 20% of the monomer disappears in 34 minutes for initial monomer concentration of 0.04 and also for 0.8 moles/lit. What rate equation represents the disappearance of the monomer? **[8]**

OR

Q4) a) The first order reversible liquid reaction $A \rightleftarrows R$, C_{AO} = 0.5 mol/lit, C_{RO} = 0, takes place in a batch reactor. After 8 minutes, conversion of A is 33% while equilibrium conversion is 66%. Find the rate equation for this reaction. **[6]**

b) Show that for n^{th} order reaction **[6]**

$$t_{1/2} = C_{AO}^{1-n}\left[\frac{2^{n-1}-1}{K(n-1)}\right]$$

c) What is the auto catalytic reaction? Derive the relation between time and conversion of auto catalytic reaction. **[4]**

Q5) a) Explain space time and space velocity. **[4]**

b) The elementary liquid phase reaction

$$A + 2B \underset{k_2}{\overset{k_1}{\rightleftharpoons}} R$$ **[8]**

With rate equation,

$$-r_A = -\frac{1}{2}r_B = (12.5\ \text{lit}^2/\text{mol}^2.\text{min})C_A C_B{}^2 - (1.5\,\text{min}^{-1})C_R, \left[\frac{\text{Mol}}{\text{lit.min}}\right]$$

is to take place in a 6 lit. Steady state MFR. Two feed stream, one containing 2.8 mol A/lit and the other containing 1.6 mol B/lit, are to be introduced at equal volumetric flow rate into the reactor, and 75% conversion of limiting component is desired. What would be the flow rate of each stream? Assume constant density throughout.

c) Derive the performance equation of steady state MFR. **[4]**

OR

Q6) The elementary irreversible aq. phase reaction A+B $\rightarrow$ R+S is carried out isothermally. Equal valumetric flow rate of two liquid streams are introduced into a 4 lit. Mixing tank, one stream containing 0.02 mol A/lit, the other 1.4 mole B/lit. The mixed stream is then passed through 16 lit. PFR. We find that some R is formed in the mixing tank; its concentration being 0.002 mole/lit. Assuming that the mixing tank acts as a MFR, find the concentration of R at the exit of the PFR as well as the fraction of initial A that has been converted in the system. **[16]**

SECTION - II

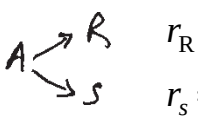
Q7) a) Using separate feeds of A and B sketch the contacting pattern and reactor conditions which would best promote the formation of product R for the following systems of elementary reactions. **[6]**

i) $A + B \rightarrow R$
$A \rightarrow S$

ii) $A + B \rightarrow R$
$2A \rightarrow S$

iii) $A + B \rightarrow R$
$2A \rightarrow S$
$2B \rightarrow T$

b) Liquid reactant A decomposes as follows : **[6]**



$r_R = k_1.C_A^2, \; k_1 = 0.4 m^3/mol.min$

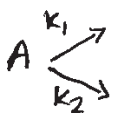
$r_s = k_2.C_A, \; k_2 = 2 \; min^{-1}$

A feed of aqueous A (C_{AO} = 40 mol/m^3) enters a reactor, decomposes, and a mixture of A,R & S leaves the mixed flow reactor. Find C_R, C_S and $\Im$ for X_A = 0.9 in a mixed flow reactor.

c) Discuss about product distribution for the following reaction when **[6]**

i) $a_1 > a_2$ and

ii) $a_1 < a_2$



$r_R = k_1 C_A^{a_1}$ (desired product)

$r_s = k_2 C_A^{a_2}$ (unwanted product)

OR

Q8) a) Liquid reactant A decomposes as follows : **[6]**

$r_R = k_1.C_A^2, \; k_1 = 0.4 m^3/mol.min$

$r_S = k_2.C_A, \; k_2 = 2 \; min^{-1}$

A feed of aqueous A (C_{AO} = 40 mol/m^3) enters a plug flow reactor, decomposes and a mixture of A, R and S leaves. Find C_R, C_S and $\Im$ for X_A = 0.9 in a plug flow reactor.

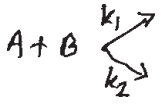
b) Define the term : **[6]**

i) Instaneous fractional yield.

ii) Overall fractional yield.

iii) Selectivity.

c) Consider the aqueous reactions **[6]**

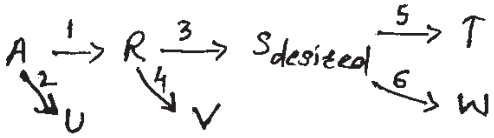


$$\text{R, desired } \frac{dC_R}{dt} = 1.0 C_A^{1.5} C_B^{0.3} \text{ mol/lit.min}$$

$$\text{S, unwanted } \frac{dC_S}{dt} = 1.0 C_A^{0.5} C_B^{1.8} \text{ mol/lit.min}$$

For 90% conversion of A find the concentration of R in the product stream. Equal volumetric flowrates of the A and B streams are fed to the reactor, and each stream has a concentration of 20 Mol/lit of reactant. The flow in the reactor follows plug flow.

Q9) a) Qualitatively find the optimum temperature progression to maximize C_S for the reaction scheme. **[4]**



Data: $E_1 = 10$, $E_2 = 25$, $E_3 = 15$, $E_4 = 10$, $E_5 = 20$, $E_6 = 25$

b) Between 0ºC and 100ºC determine the equilibrium conversion for the elementary aqueous reaction. **[12]**

$$\begin{cases} \Delta G^o_{298} = -14130 \text{ J/mol} \\ \Delta H^o_{298} = -75300 \text{ J/mol} \end{cases}$$

$$C_{PA} = C_{PR} = \text{constant}$$

Present the results in the form of temperature versus conversion. What restriction should be placed on the reactor operating isothermally if we are to obtain a conversion of 75% or higher?

OR

Q10) a) Derive the equation for standard heat of reaction at temperature T_2 when standard heat of reaction at temp. T_1 is given to you. **[6]**

b) For the following reaction the standard heat of reaction at 298ºk is – 164.987 kJ. The reaction is –

CO_2 (g) + 4H_2 (g) $\rightarrow$ 2H_2O (g) + CH_4 (g)

The constants in the heat capacity (J/mol°k) are :

	α	β	γ
CO_2	26.75	42.26×10^{-3}	-14.25×10^{-6}
H_2	26.88	4.35×10^{-3}	-0.33×10^{-6}
H_2O	29.16	14.49×10^{-3}	-2.02×10^{-6}
CH_4	13.41	77.03×10^{-3}	-18.74×10^{-6}

Calculate the standard heat of reaction at 773°k. **[10]**

Q11) a) Explain Macro and Microfluid behaviour with neat diagram. **[6]**

b) The concentration readings in the following table represent a continuous response to a pulse input into a closed vessel which is to be used as a chemical reactor. Calculate the Mean residence time of fluid in the vessel '*t*', and tabulate and plot exit age distribution E. **[10]**

Time *t*, min	Tracer output concentration C_{Pulse} (gm/lit fluid)
0	0
5	3
10	5
15	5
20	4
25	2
30	1
35	0

OR

Q12) a) Give the relationship between F and E curve. **[4]**

b) Write short notes on : **[12]**

i) Dispersion Model.

ii) Tank in series Model.

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Total No. of Questions : 12]

SEAT No. :

P1121

[Total No. of Pages : 3

[4163]-307
T.E. (Chemical)
TRANSPORT PHENOMENA
(2008 Pattern) (Sem. - II)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answers to the two sections should be written in separate books.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
5) ***Assume suitable data if necessary.***

SECTION - I

Q1) a) Derive Hagen-Poiseuille equation for flow of fluid through a circular tube. **[12]**

b) An horizontal annulus is 27 ft. long. The outside radius of inner cylinder is 0.495 inch. The inside radius of outer cylinder is 1.1 inch. The fluid density is $80.3\frac{tb}{\text{ft}^3}$ and viscosity is $136.8\frac{tb(m)}{\text{ft. hr}}$. What is volume rate of flow if impressed pressure drop is 5.39 psi? **[6]**

OR

Q2) a) Derive the expression of velocity and average velocity for flow of falling film with variable viscosity i.e. $\mu = \mu_{0e}^{-\alpha x/\delta}$. **[12]**

b) An oil has kinematic viscosity of 2×10^{-4} m^2/s and density 800 kg/m^3. What should be mass flow rate of this film down a vertical wall in order to have film thickness of 2.5 mm. **[6]**

Q3) a) A stormer viscometer consists of two concentric cylinders, the inner one of which rotates while the outer is held stationary. Viscosity is determined by measuring the rate of rotation of inner cylinder under the application of known torque. Develop an expression for velocity distribution as a function of applied torque, for laminar flow of a newtonian fluid. Assume that V0 is a function of radius only. **[10]**

P.T.O.

b) Derive dimensionless form of equation of change. **[6]**

OR

Q4) a) Explain macroscopic mass balance equation. **[4]**

b) Derive Ergun equation for flow of a fluid through packed column. **[12]**

Q5) a) Explain thermal energy balance equation. **[4]**

b) Derive the expression of heat flux and temperature distribution for nuclear heat source of spherical form surrounded by spherical shell of aluminium cladding. **[12]**

OR

Q6) Heat is flowing through an annular wall of cylinder of inside radius r_0 and outside radius r_1. Thermal conductivity varies linearly from k_0 at T_0 to k_1 at T_1. **[16]**

a) Develop an expression for heat flow rate through the wall at r_0.

b) Show how above expression can be simplified when radius $(r_1\text{-}r_0)$ is very small.

SECTION - II

Q7) a) Show that the temperature distribution for flow of an ostwald-de-wade non-newtonian fluid between two co-axial cylinders with outer cylinder rotating is same as that of Newtonian fluid with Br, Brikman number replaced by **[8]**

$$^{B}v_n = \frac{mV^{n+1}}{Kb^{n-1}(T_b = T_o)}$$

b) What are time smoothing energy equations. State its utility. **[8]**

OR

Q8) a) Derive expression for temperature rise, maximum temperature rise, average temperature rise and heat flow at the surface for heat conduction with an electrical heat source. **[8]**

b) State and explain comparison of forced and free convection in nonisothermal systems. **[8]**

Q9) a) Estimate diffusivity for acetic acid in dilute aqueous solutions at 12.5°C. The density of acetic acid at its normal boiling point is 0.937 g/cm^3, $\psi_B = 2.6$, $M_B = 18.02$, $\mu = 1.22$CP. **[8]**

b) Explain diffusion through stagnant gas film. **[8]**

OR

Q10) a) Derive equation of molar flux for diffusion with heterogeneous chemical reaction. **[8]**

b) The solute HCl (A) is diffusing through a thin film of water (B) 2.0 mm thick at 283°F. The concentration of HCl at point (1) at one boundary of film is 12 wt% HCl (density $\rho_1 = 1061 \text{kg/m}^3$) and other boundary at point (2) it is 6 wt% HCl ($\rho_2 = 1030$ kg/m^3). The diffusion coefficient of HCl in water is 2.5×10^{-9} m^2/s.

Assuming steady state conditions prevail and the boundary is impermeable to water, calculate the flux of HCl in K. Mole/m^2. sec. **[8]**

Q11) a) Write analogies among mass, heat and momentum transfer. **[6]**

b) Co-relation of binary mass transfer coefficients in one phase at low mass transfer rates. **[6]**

c) Write short note on Macroscopic and microscopic balance. **[6]**

OR

Q12) A spherical drop of water, 0.05 cm in diameter is falling at a velocity of 215 cm/sec through dry still air at 1 atm. Pressure. Estimate the instantaneous rate of evaporation from the drop if the drop surface is at 21°C and air at 60°C. The vapour pressure of water at 21°C is 0.0247 atm. Assume pseudo steady state condition. **[18]**

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Total No. of Questions : 12]

SEAT No. :

P1122

[Total No. of Pages : 4

[4163]-308
T.E. (Chemical)
CHEMICAL ENGINEERING DESIGN - I
(2008 Pattern) (Sem. - II)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answers to the TWO sections should be written in separate answer books.***
2) ***Draw neat sketches wherever necessary.***
3) ***Use of logarithmic tables, calculator and steam table is permitted.***
4) ***Assume suitable data if necessary and mention it.***

SECTION - I

Q1) a) Discuss various factors to be considered for selection of material of construction. **[5]**

b) What is proportioning of vessels? Derive volume relationship for optimum proportions of vessels with elliptical dished heads. **[8]**

c) Explain general design considerations for pressure vessels. **[5]**

OR

Q2) a) What is optimization? Discuss in detail methods of optimization. **[10]**

b) Explain the pressure and radiography testing of equipment. **[8]**

Q3) a) Explain the selection of a head for pressure vessels. With neat sketches explain the constructional features of different types of heads and give their design equations. **[10]**

b) Explain different types of flanges and bolt design and selection consideration in chemical process industry. **[6]**

OR

Q4) a) A vessel is to have one end closed by a blind flange. Calculate the minimum thickness of blind flange for the design data given **[10]**

- Design pressure = 170 kg/cm^2
- Design temperature = 121°C

P.T.O.

- Allowable bolt stress at gasket seating and operating conditions = 1306 kg/cm^2
- Allowable flange stress at gasket seating and operating conditions = 1190 kg/cm^2
- Inside diameter of gasket = 34.4 cm.
- Width of gasket = 2.5 cm, m = 3, Ya = 680.3 kg/cm^2
- Bolt circle diameter = 56.2 cm
- 16 bolts of 50 mm diameter are used.

b) Explain the method for calculating the thickness of torispherical head subjected to internal pressure. **[6]**

Q5) a) Explain various types of roofs used for storage vessels. **[8]**

b) Explain in brief the various types of losses during storage of volatile liquids. **[4]**

c) A storage tank is to store 30000 kgs of Benzene having density 800 kg/m^3. Due to space limitations the maximum tank diameter can be 2.4 m. Estimate the height of the tank if the liquid is filled up to 90% of the capacity of the storage tank. **[4]**

OR

Q6) a) Explain the stresses developed in the walls of high pressure vessel. **[4]**

b) Explain shrink fit construction for high pressure vessels. **[4]**

c) A high pressure vessel is to be operated at 100 MN/m^2. The inside diameter of the vessel is 30.5 cm. Steel having yield stress 466 MN/m^2 is selected for fabrication. Estimate the wall thickness required by various theories with factor of safety 1.6 **[8]**

SECTION - II

Q7) a) A tall vertical 1.5 m in diameter and 13 m high is to be provided with the skirt support. Weight of the vessel with all its attachments is 80,000 kg. Diameter of skirt is equal to the diameter of the vessel. Height of skirt is 2.2 m., wind pressure tensile stress of skirt material = 960 kg/m^2, permissible compressive stress is $\frac{1}{3}$rd yield of material. Yield stress is 2400 kg/cm^2. Estimate the thickness of skirt support. **[10]**

b) Explain saddle support with neat sketch and show the various proportions for saddle support. **[6]**

OR

Q8) a) What are the various stresses developed in the tall vessels? **[6]**

b) What type of supports is used for the reactor? Explain with neat sketch. **[10]**

Q9) a) 3000 kg/hr of furnace oil is to be heated from 10º to 90ºC in a shell and tube heat exchanger. Heating is done by steam available at 120ºC. Oil is circulated through the tubes while steam is circulated in shell. Tubes of 16.5 mm ID and 19 mm OD are available. Length of tubes = 3 m. The film coefficient of heat transfer for oil is 90 $W/m^2.K$ while film coefficient of heat transfer for condensing steam is 7400 $W/m^2.K$.

Density of furnace oil = 900 kg/m^3.

Specific heat of furnace oil = 1970 J/kg.K

Fouling resistance for furnace oil = 0.0009 $m^2.K/W$

Fouling resistance for steam side = 0.00005 m^2K/W

Suggest a suitable design of the shell and tube heat exchanger.

Maximum oil velocity that can be used is 0.05 m/sec. Estimate the number of passes on tube side required in a heat exchanger. **[12]**

b) What do you mean by LMTD? Why is it used in heat exchanger design? **[6]**

OR

Q10) a) Why are baffles used in shell and tube heat exchangers? Explain with neat sketch various types of baffles. **[6]**

b) Water is heated in a double pipe heat exchanger using dry saturated steam supplied on the annulus side. Steam condenses at 320ºK and there is no subcooling. Water flows at 2 m/s through the tube of 25 mm outside diameter and 2500 mm length. Calculate the overall heat transfer coefficient based on outside diameter, if the water inlet and outlet temperatures are 293 and 295ºK respectively. How would the outlet temperature change if the water velocity is increased by 50%? **[12]**

Data for water

Density = 1000 kg/m^3, Specific heat = 4.18 KJ/KgºK

Inside film heat transfer coefficient may be estimated by following equation applicable for water.

$hi = 4280\ (0.00488\ T-1)\ (V)^{0.8}(d)^{-0.2}, W/m^2.ºK$

Where T = mean water temperature, ºK

V = Water velocity m/s,

d = may be taken as pipe OD in m.

Q11) a) Explain the forward feeding and backward feeding method for multiple effect evaporators. Mention their advantages and disadvantages. Draw neat sketch. **[8]**

b) With neat sketch, explain the working of plate heat exchanger. Mention the advantages and disadvantages of PHE. **[8]**

OR

Q12) a) What is temperature correction factor? How is it calculated? Why is it used in design of heat exchanger? **[8]**

b) Explain the design procedure of forced recirculation reboiler. **[8]**

✷ ✷ ✷

Total No. of Questions : 12]

SEAT No.:

P1125

[Total No. of Pages : 3

[4163]-314
T.E. (Petroleum)
HYDROCARBON PROPERTIES AND THERMODYNAMICS
(2008 Pattern) (Sem. - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Figures to the right indicate full marks.***
4) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam table is allowed.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Define : **[8]**

i) Intensive Properties.
ii) Extensive Properties.
iii) State function.
iv) Path function.

b) A spherical balloon of diameter 0.5m contains a gas at 1 bar and 300K. The gas is heated and the balloon is allowed to expand. The pressure inside the balloon is found to vary linearly with diameter. What would be the work done by the gas when pressure reaches 5 bar? **[8]**

OR

Q2) a) Explain the throttling process (Joule Thomson Expansion). **[8]**

b) Explain the term entropy. Give its mathematical definition and explain the terms involved in it. **[8]**

Q3) a) Write a note on the Virial equation for real gases. **[8]**

b) One kilo mol of CO_2 occupies a volume of $0.381 m^3$ at 313K. Compare the pressures given by **[5]**

i) Ideal gas equation.
ii) Vander Waal's equation.

c) Write the equations for work done by an ideal gas in constant temperature process and adiabatic process. **[5]**

P.T.O.

OR

Q4) a) Calculate the molar volume of ammonia at 373K and 10 bar using Redlich Kwong equation given that the critical temperature is 405.5K and the critical pressure is 112.8 bar. **[5]**

b) Discuss the principle of corresponding states. **[5]**

c) Discuss the phase behavior of pure fluids with P-T diagram. **[8]**

Q5) a) Derive the Clausius Clayperon equation and give its significance. **[8]**

b) Discuss the method of determining fugacity using compressibility factor and residual volume method. **[8]**

OR

Q6) a) The density of gaseous ammonia at 473K and 50 bar is 24.3kg/m^3. Estimate its fugacity. **[4]**

b) The Henry's law constant for oxygen in water at 298K is 4.4×10^4 bar. Estimate the solubility of oxygen in water at 298K for a partial pressure of oxygen at 0.25 bar. **[4]**

c) Discuss the Gibbs-Duhem equation and express it in different forms. **[8]**

SECTION - II

Q7) a) Give the procedure for the evaluation of dew point and bubble point of a multicomponent mixture. **[10]**

b) At 303 K, the vapour pressure of benzene (A) and toluene (B) are 15.75 kPa and 4.89 kPa respectively. Determine the partial pressures and weight composition of vapour in equilibrium with liquid mixture consisting of equal weights of the two components. **[8]**

OR

Q8) a) For a system of n-pentane (1) and n-heptane (2), the vapour pressures are given by the Antoine equation. **[12]**

$$\ln P = A - \frac{B}{T - C}$$

Where P is in kPa and T is in K.

The constants are as follows :

System	A	B	C
n-pentane	13.8183	2477.07	40
n-heptane	13.8587	2911.32	56.56

Assuming that the solution formed is ideal, calculate the composition of vapour in equilibrium with a liquid containing 34% (mol) pentane and the equilibrium temperature at P = 95 kPa.

b) Compare between maximum and minimum boiling azeotropes. **[6]**

Q9) a) Write a note on the Darcy's law. Give its significance in the study of reservoir engineering. **[8]**

b) Write the Young Laplace equation. Elaborate its significance. **[8]**

OR

Q10) a) Derive an expression to explain the effect of curvature on saturation pressure. **[8]**

b) Give the effect of wettability and porous medium on the phase behavior of pure substances. **[8]**

Q11) a) What do you mean by Eutectic Point? Explain it with respect to liquid-solid equilibrium diagram. **[8]**

b) What are gas hydrates? With the help of a phase diagram, explain the formation of gas hydrates. **[8]**

OR

Q12) a) List the various thermodynamic models for explaining wax precipitation. Explain any one. **[8]**

b) What are asphaltenes? Give the various properties of asphaltenes. **[8]**

Total No. of Questions : 12]

SEAT No.:

P1126

[Total No. of Pages : 4

[4163]-322
T.E. (Petrochemical)
APPLIED HYDROCARBON THERMODYNAMICS
(2008 Pattern) (Sem. - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Figures to the right indicate full marks.***
4) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) The PVT behavior of nitrogen is represented by the ideal gas equation PV = nRT, where n is the number of moles of the gas and R the ideal gas constant. (R = 8.314 kJ/kmol K) The heat capacities of gas are C_p = 29.1 kJ/kmol K and C_v = 20.8 kJ/kmol K. The gas initially at 10 bar and 280 K is undergoing a change of state to the final condition of 1 bar and 340 K. Determine the change in internal energy and the change in enthalpy. **[8]**

b) Discuss the qualitative difference between heat and work. **[8]**

OR

Q2) a) Write a note on the internal energy of a system. **[8]**

b) Two perfectly insulated tanks each of capacity 1m^3 are connected by means of a small pipeline fitted with a valve. The first tank contains ideal gas at 300 K and 200 kPa and the second one is completely evacuated. The valve is opened and the pressure and temperature are equalized. Determine the change in total entropy. **[8]**

Q3) a) State the principle of corresponding states and discuss the utility of compressibility charts. **[8]**

P.T.O.

b) Calculate the compressibility factor and the molar volume for methanol vapour at 500 K and 10 bar by using the truncated form of virial equation. Experimental values of the virial coefficients are $B = -2.19 \times 10^{-4}$ m^3/mol; $C = -1.73 \times 10^{-8}$ m^6/mol. The critical temperature and pressure of methanol are 512.6 K and 81 bar. **[8]**

OR

Q4) a) An ideal gas is undergoing a series of three operations : the gas is heated at constant volume from 300 K and 1 bar to a pressure of 2 bar. It is expanded in a reversible adiabatic process to a pressure of 1 bar. It is cooled at constant pressure of 1 bar to 300 K. Determine the heat and work effects for each step. Assume $C_p = 29.3$ kJ/kmol K. **[12]**

b) Draw a PV diagram clearly showing the various details so as to explain the phase behavior of pure fluids. **[4]**

Q5) a) Give the classification of thermodynamic properties. Derive an expression for the work function. (Helmholtz free energy). **[9]**

b) Write a note on the Clayperon equation. Derive the Clausius Clayperon equation. **[9]**

OR

Q6) a) Discuss any one method for the determination of fugacity of pure gases. **[9]**

b) What are partial molar properties? Which are the various methods for determining the partial molar properties? **[9]**

SECTION - II

Q7) a) Discuss the procedure for obtaining the T-x-y diagram for an ideal binary solution. **[8]**

b) The vapour pressures of benzene and toluene are given below : **[8]**

T, K	353.1	358	363	368	373	378	383	383.6
P_A^S, kPa	101.3	116.9	135.4	155.7	179.1	204.2	233	240
P_B^S, kPa	39.6	46	54	63.3	74.2	86	99	101.3

Calculate the equilibrium data for the system at 101.3 kPa and formulate an equation for the equilibrium diagram in terms of average relative volatility.

OR

Q8) Toluene (1) and water (2) are immiscible in liquid state. Determine the following when the vapour mixtures of these species contain 23% (mol) toluene at 101 kPa.

i) Dew point temperature and the composition of the first drop of liquid that is formed.

ii) Bubble point temperature and the composition of the last bubble of vapour. **[16]**

Q9) a) List the various activity coefficient equations. Write a note on the Margules equation. **[10]**

b) A stream of isopropanol - water mixture is flashed into a separation chamber at 535 K and 91.2 kPa. A particular analysis of the liquid product showed an isopropanol content of 4.7% (mol), a value that deviated from the norm. It is suspected that an air leak into the separator might have caused this. Do you agree? The vapour pressures of the pure propanol and water are 91.11 kPa and 47.36 kPa respectively. The van Laar constants are A = 2.470 and B = 1.094. **[8]**

OR

Q10) a) Distinguish between maximum and minimum boiling azeotropes. **[8]**

b) Construct the P-x-y diagram for the cyclohexane (1) - benzene (2) system at 313 K given that at 313 K the vapour pressures are $P_1^S = 24.62$ kPa and $P_2^S = 24.41$ kPa. The liquid - phase activity coefficients are given by $\ln \gamma_1 = 0.458\ x_2^2$ and $\ln \gamma_2 = 0.458\ x_1^2$ **[10]**

Q11) a) What is the effect of temperature on equilibrium constant? Using Van't Hoff equation predict the effect of increasing temperature on endothermic and exothermic reaction. **[8]**

b) One mole of steam undergoes the water-gas shift reaction at a temperature of 1100 K and a pressure of 1 bar. **[8]**

$CO\ (g) + H_2O\ (g) \rightarrow CO_2\ (g) + H_2\ (g)$

The equilibrium constant for the reaction is K = 1. Assuming ideal gas behavior, calculate the fractional dissociation of steam in the following cases and discuss the effect of the presence of excess reactant on the extent of reaction.

i) CO supplied is 100% in excess of the stoichiometric requirement.

ii) CO supplied is only 50% of the theoretical requirement.

OR

Q12) a) Discuss the various methods for evaluating equilibrium constants. **[8]**

b) The standard heat of formation and standard free energy of formation of ammonia at 298 K are - 46000 J/mol and - 16500 J/mol respectively. Calculate the equilibrium constant for the reaction.

N_2 (g) + 3 H_2 (g) $\rightarrow$ 2 NH_3 (g)

at 500 K assuming that the standard heat of reaction is constant in the temperature range 298 to 500 K. **[8]**

Total No. of Questions : 12]

SEAT No. :

P1128

[Total No. of Pages : 3

[4163] - 325
T.E. (Petrochemical)
INSTRUMENTATION & INSTRUMENTAL ANALYSIS
(2008 Pattern) (Sem. - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Attempt Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8, Q.9 or Q.10, Q.11 or Q.12.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Figures to the right indicate full marks.***
4) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam table is allowed.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Draw a block diagram of instrument system & explain different functional elements of instrument with suitable example. **[8]**

b) Derive the step response of first order dynamics of thermometer. **[8]**

OR

Q2) a) Define the following terms: **[8]**

i) Sensitivity.

ii) Accuracy.

iii) Speed of response.

iv) Resolution.

b) A thermometer having a time constant of 0.1 min is at steady state temperature of 90ºC. At time (t = 0) the thermometer is placed in a temperature bath maintained at 100ºC. Determine the time needed for the thermometer to read 98ºC. **[8]**

Q3) a) What are the different types of direct & indirect methods of liquid level measurement? Explain with neat sketch any one from indirect method. **[8]**

b) What are the different types of elastic pressure transducers used for pressure measurement? Explain with neat sketch construction & working any one of them. **[8]**

P.T.O

OR

Q4) a) Describe with neat sketch, construction, working & principle of radiation pyrometer with its advantages & disadvantages. **[8]**

b) What is the principle of thermocouple? Give different types of thermocouples. **[8]**

Q5) a) Discuss with neat sketch, construction, working & principle of turbine flow meter with its advantages & disadvantages. **[9]**

b) Explain the different types of valves & valve characteristics with neat diagram. **[9]**

OR

Q6) a) Discuss with neat sketch, construction, working & principle of electro-magnetic flow meter with its advantages & disadvantages. **[9]**

b) Give comparison between orifice-meter & venturi-meter with help of neat sketch. **[9]**

SECTION - II

Q7) Write short note on: **[18]**

a) Crude oil assay.

b) ASTM method for determination of flash point.

c) Principle for IR spectroscopy & IR sample preparation.

OR

Q8) a) Explain the principle for Mass spectroscopy with neat figure. **[9]**

b) Explain with neat diagram the instrumentation for time of flight mass spectrometer. **[9]**

Q9) a) Explain different types of chromatography with neat diagram. **[8]**

b) Explain with neat diagram the instrumentation for HPLC. **[8]**

OR

Q10) a) Explain different types of x-ray spectroscopy with neat diagram. **[8]**

b) Explain with neat diagram the instrumentation for HPLC. **[8]**

Q11) a) Explain with neat diagram the instrumentation x-ray diffractometer. **[8]**

b) Describe various methods of viscosity measurement. **[8]**

OR

Q12) a) Give the classification or different constituents of lubricant & methods of analysis. **[8]**

b) Describe in detail construction & working of Abbe's refractometer. **[8]**

Total No. of Questions : 12]

SEAT No.:

P1129

[Total No. of Pages : 4

[4163]-326
T.E. (Petrochemical)
TRANSPORT PHENOMENA
(2008 Pattern) (Sem. - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Attempt Q. 1 or Q. 2, Q. 3 or Q. 4, Q. 5 or Q. 6, Q. 7 or Q. 8, Q. 9 or Q. 10, Q. 11 or Q. 12.***
2) ***Figures to the right indicate full marks.***
3) ***Use of electronic calculators is allowed.***
4) ***Draw neat sketch wherever necessary.***

SECTION - I

Q1) a) Compare the temperature dependency of viscosity, thermal conductivity and diffusion coefficient for both gases and liquids. **[8]**

b) Explain experimental method to determine thermal diffusivity. Choose your own system. **[8]**

OR

Q2) a) Explain the experimental method to determine diffusion coefficient. Choose your own system. **[8]**

b) Explain in detail the role of three fundamental transport processes in any two separation processes. **[8]**

Q3) a) Derive the differential equation of momentum transfer over a representative volume element fixed in space. **[8]**

b) Write a short note on dimensional analysis in momentum transfer. **[8]**

OR

Q4) a) Derive the differential equation of energy transfer over a representative volume element fixed in space. **[8]**

b) Write a short note on dimensional analysis in heat transfer. **[8]**

Q5) a) Derive boundary layer equation for laminar flow over a flat plate with a neat sketch. **[9]**

b) Write a short note on Prandtl's mixing length and Eddy thermal diffusivity. **[9]**

OR

P.T.O.

Q6) a) What do you mean by Reynolds stresses? State and explain the terms involved in Modified Equation of motion for turbulent flow. **[6]**

b) Explain the following models relating mass transfer coefficient and diffusivity : **[12]**

i) Film mass transfer theory.

ii) Penetration theory.

iii) Boundary layer theory.

SECTION - II

Q7) a) State any four industrial reaction applications where stirred tank reactors are used. Discuss various industrial problems related to mixing and agitation applications. **[9]**

b) SCALE UP PROBLEM : A flat - blade turbine agitator with disk having flat six blades is installed in a tank. The tank diameter is 1.83m, the turbine diameter is 0.61m, the width is 0.122m and the depth of the liquid in the tank is equal to its diameter. The tank contains four baffles, each having a width of 0.15m. the turbine is operated at 90 rpm and the liquid has a viscosity of 10 cp and a density of 929kg/m^3. It is desired to scale up the system where equal rate of mass transfer is desired for a vessel whose volume is three times large. **[9]**

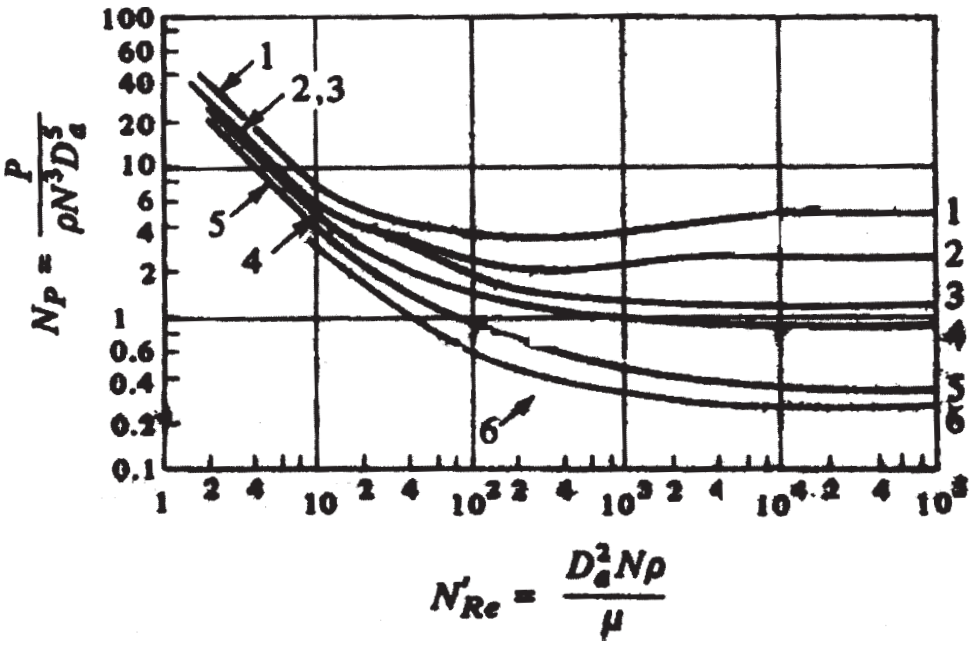


FIGURE : POWER NUMBER CHART FOR Q.NO.7 B

DETAILS :

CURVE 1 : Flat six blade turbine with disc, 4 baffles, for impellar diameter : width of impellar = 5 and Tank diameter : width of baffle = 12

CURVE 2 : Flat six blade open turbine, 4 baffles, for impellar diameter : width of impellar = 8 and Tank diameter : width of baffle = 12

CURVE 3 : Six blade open turbine pitched blade, 4 baffles, for impellar diameter : width of impellar = 8 and Tank diameter : width of baffle = 12

CURVE 4 : Propeller with 4 baffles with Tank diameter : width of baffle = 12

CURVE 5 : Propeller with 4 baffles with Tank diameter : width of baffle = 10

CURVE 6 : High efficiency impellar with 4 baffles with Tank diameter : width of baffle = 12

OR

Q8) a) Write a short note on Selection of Impellers for Mixing and Agitation applications. **[9]**

b) MIXING TIME PROBLEM : A flat - blade turbine agitator with disk having flat six blades is installed in a tank. The tank diameter is 1.83m, the turbine diameter is 0.61m, the width is 0.122m and the depth of the liquid in the tank is equal to its diameter. The tank contains four baffles, each having a width of 0.15m. the turbine is operated at 90 rpm and the liquid has a viscosity of 10 cp and a density of 929kg/m^3. A. Calculate the mixing time. B. For same power per unit volume as in (A) calculate the mixing time for a smaller vessel of diameter 0.3m instead of 1.83m, other dimensions remaining same. **[9]**

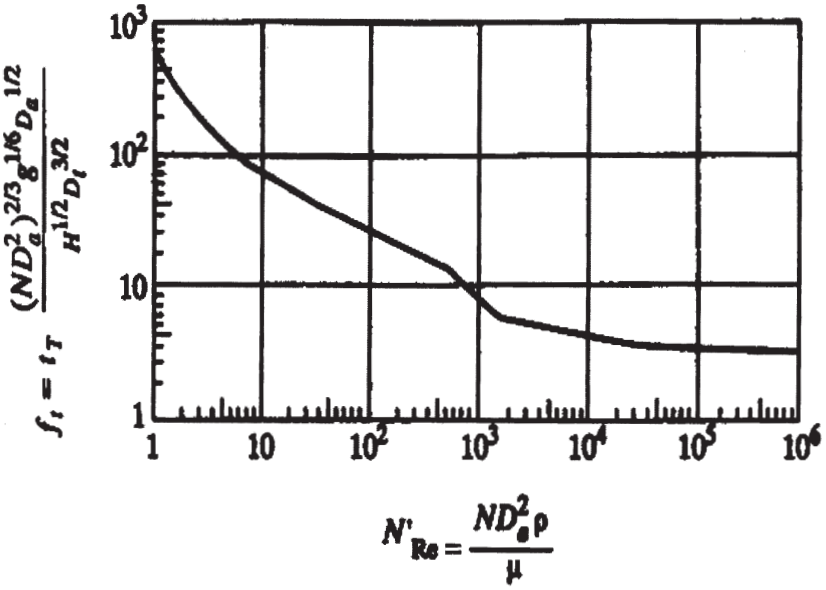


FIGURE : MIXING TIME CHART FOR Q.NO.8 B

Q9) a) The initial temperature within an insulated cylindrical metal rod of 4cm long are given by T = 50 (4 – x) for $0 < x < 4$, where x is the distance from one face. Both the end are maintained at 0ºC. Find the temperature as a function of x and time t for $(0 < t < 1)$ use explicit method. Assume $\Delta x = 1$ $\Delta t = 0.25$. The heat flow is governed by the equation $\left(2\frac{\partial^2 T}{\partial x^2} = \frac{\partial T}{\partial t} \right)$. **[10]**

b) Write a short note on unsteady state heat conduction and implicit numerical method with respect to stability of numerical solution. **[6]**

OR

Q10) a) The heat equation is given as $\left(\frac{\partial T}{\partial t} = \frac{\partial^2 T}{\partial x^2} \right)$. The initial temperature condition is given as at t = 0, T = sin πx ; at x = 0 and x = 1, T = 0 for all values of time t. where T is temperature, x is the length and t is the time. Taking time increment as 0.002 and length increment as 0.2 find the variation of temperature T for t = 0 to t = 0.006 and x = 0 to x = 1.**[10]**

b) Write a short note on convergence of a numerical solution. **[6]**

Q11) a) Derive transient mass diffusion equation in one direction. **[8]**

b) Write a short note on convective mass transfer. **[8]**

OR

Q12) a) Explain the numerical method for explicit solution of one dimensional unsteady state molecular diffusion in a slab of finite width. **[8]**

b) Discuss various boundary conditions for Numerical methods for one dimensional unsteady state molecular diffusion in a slab of finite width exposed to a flowing fluid. State your assumptions clearly. **[8]**

☒☒☒☒

Total No. of Questions : 12]

P1130

SEAT No.:

[Total No. of Pages : 7

[4163]-327
T.E. (Petrochemical)
MASS TRANSFER - II
(2008 Pattern) (Sem. - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer three questions from section-I and three questions from section-II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) Attempt any three from the following : **[18]**

a) What is the equation for q line? What are the five possible feed conditions?

b) Write a brief note on : Choice of Solvent for Gas Absorption.

c) Derive Raleigh's equation for simple distillation.

d) Compare tray towers versus packed towers.

e) Write a brief note on : "Optimum reflux ratio for distillation".

f) Write a brief note on : "HETP".

OR

Q2) a) 5500kg/hr. of a SO_2 - air mixture containing 5% by volume of SO_2 is to be scrubbed with 2, 50,000kg/hr of water in a packed tower. The exit concentration of SO_2 is reduced to 0.15%. The tower operates at 1 atm. The equilibrium relation is given by : $Y = 30\,X$

where $$Y = \frac{\text{Mole}\,SO_2}{\text{Mole air}}$$

$$X = \frac{\text{Mole}\,SO_2}{\text{Mole water}}$$

If the packed height of tower is 0.4 m, calculate the height of transfer unit. **[8]**

P.T.O.

b) A soluble gas is absorbed from a dilute gas air mixture by counter-current scrubbing with solvent in a packed tower. If the liquor led to the top of the tower contains no solute, show that number of transfer units required is given by :

$$N=\left[\frac{1}{\left(1-\frac{mG_m}{L_m}\right)}\right] ln\left[\left(1-\frac{mG_m}{L_m}\right)\frac{y1}{y2}+\frac{mG_m}{L_m}\right]$$

where, G_m and L_m = flow rates of the gas and liquid in k mole/s.m^2 of tower area; y1, y2 = mole fraction of the gas at the inlet and outlet of the column. The equilibrium relation is given as : $y_e = mx$.

where y_e = mole fraction in the gas is equilibrium with x mole fraction in the liquid. **[10]**

Q3) a) Vapor pressures of chlorobenzene and water are given below :

Data :

Pressure, mm Hg	100	50	30	26
Temperature ºC, Chlorobenzene	70.4	53.7	42.7	34.5
Temperature ºC, Water	51.7	38.5	29.9	22.5

If steam is blown into the still containing a mixture of these two components and the total pressure is 140 mm Hg, estimate the temperature of boiling and the composition of the distillate. The two components are immiscible in the liquid. **[8]**

b) A liquid feed consisting of 1200 g moles of mixture containing 30% naphthalene and 70% dipropylene glycol is differentially distilled at 100 mm Hg pressure and final distillate contains 55% of the feed solution. The VLE data are :

x	8.4	11.6	28.0	50.6	68.7	80.6	88
y	22.3	41.1	62.9	74.8	80.2	84.4	88

Determine the amount of distillate determine the concentration of naphthalene in residue and distillate. **[8]**

OR

Q4) A continuous fractionating column is to be designed for separating 20,0000 kg per hour of a liquid mixture containing 30 mole percent methanol and 65 mole percent water into an overhead product containing 98 mole percent methanol and a bottom product having 98 mole percent water. A mole reflux ratio of 2.6 is used. Calculate :

a) Moles of overhead product obtained per hour and

b) Number of ideal plates and location of the feed plate if the feed is at its bubble point.

Equilibrium data :

x	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
y	0.41	0.57	0.66	0.72	0.78	0.82	0.87	0.91	0.95

Where x = mole fraction of methanol in liquid and y = mole fraction of methanol in vapor. **[16]**

Q5) a) A continuous rectification column is used to separate a binary mixture of A and B. Distillate is produced at 100-kmol/hr containing 98 mole % A. The mole fractions of A in the liquid and in the vapour, x and y respectively, from two adjacent ideal plates in the enriching section are as follows :

x	y
0.65	0.85
0.55	0.75

If the latent heat of vaporization is the same for all mixtures and if the feed is a saturated liquid, calculate :

i) The reflux ratio.

ii) Vapour rate in the stripping section in kmol/hr. **[8]**

b) Write brief notes on (any two) : **[8]**

i) Azeotropic and Extractive distillation.

ii) Fenske and Fenske-Underwood equation.

iii) Boiling point diagrams.

iv) Flash Distillation.

OR

Q6) A bubble cap-fractionating column consisting of 10 plates working at an average efficiency of 80% is being used to distill 1500 kg/hr of aqueous methanol at its bubble point entering the tower. The feed, overhead product and bottom product are 50-mole % 90-mole % and 10-mole % methanol (1) respectively. A total condenser is provided. The reflux is sent at this saturation temperature. If the reflux ratio is 1.6 times the minimum, check whether the column available is satisfactory.**The VLE data are** : **[16]**

x_1	8	10	20	30	40	50	70	80	95
y_2	36.5	41.8	57.9	66.5	72.9	77.9	87.0	95.8	97.9

SECTION - II

Q7) a) Discuss the ternary diagram for liquid-liquid extraction by taking suitable example. **[8]**

b) Develop material balance equations for countercurrent extraction operations. Show graphical representations of the final equations developed. **[8]**

OR

Q8) In order to extract acetic acid from dilute aqueous solution with isopropyl either, the two immiscible phases are passed counter-currently through a packed column 3.05 m in height and 7.6 cm in diameter. It is found that if 1950 kg/hr m^3 of pure ether is used to extract 975-kg/hr m^2 of 4% acid by weight then the ether phase leaves the column with a concentration of 1% acid by weight.

Calculate :

a) The number of overall transfer units based on raffinate phase;

b) Overall extraction co-efficient based on raffinate phase.

The equilibrium relationship is given by, wt.% acid in ether phase = 0.3 times the wt.% acid in water phase. **[16]**

Q9) a) Discuss the factors, which govern the selection of solvents to be used for liquid-liquid extraction operation. **[7]**

b) Classify the commercial extraction equipments. State working principles and construction of any extractor. **[9]**

OR

Q10) 100 kg/h of a nicotine-water solution containing 0.10 wt. fraction nicotine is extracted with 150 kg/h of kerosene containing 0.006 wt. Fraction nicotine in a counter-current stage column. The concentration of nicotine is 0.0010 wt. fraction in the exit water. Determine the theoretical number of stages required for the above separation. The equilibrium data for the above system is as follows : **[16]**

$X = \frac{\text{kg nicotine}}{\text{kg water}}$	00.0010	0.0024	0.0050	0.0075	0.0099	0.020
$Y^* = \frac{\text{kg nicotine}}{\text{kg kerosene}}$	00.00058	0.00196	0.0045	0.0068	0.0090	0.018

Q11) The adsorption of ethane as Linde molecular sieve 5A, was studied by Glessner and Myers (1969) at 35ºC. Using the data given below,

a) Determine if the Langmuir equation can be used to model the data.

b) Calculate the total surface solid, if Density of Ethane = 0.35 gm/cc.

Data : **[18]**

P, [mm Hg]	Uptake, V [cm^3 (STP/gm]
0.17	0.059
0.95	0.318
5.57	1.638
12.09	3.613
111.32	24.236
220.87	34.278
300.05	38.340
401.25	41.779
500.18	44.037
602.74	45.693

OR

Q12) Write short notes on (Any Three) : **[18]**

a) Adsorption Isotherms.

b) Classification of membrane separation processes.

c) Ultrafiltration, Nanofiltration and Microfiltration : Principes and applications.

d) Reverse Osmosis : Working principles and applications.

e) Types of adsorbents.

☒☒☒☒

Total No. of Questions : 12]

SEAT No. :

P1131

[Total No. of Pages : 2

[4163] - 329
T.E. (Petrochemical)
PETROCHEMICAL PROCESSES - II
(Sem. - II) (2008 Pattern)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to candidates:

1) ***Answer 3 questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Figures to the right indicate full marks.***
4) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Write a note on the various non-conventional sources of energy. **[8]**

b) Give the classification of crude oil. **[8]**

OR

Q2) a) Give the significance of each of the following properties. **[8]**

i) Octane Number.
ii) Diesel Index.
iii) Viscosity Gravity Constant.
iv) Reid Vapour Pressure.

b) Discuss the scenario of alternative fuels in India. **[8]**

Q3) a) Compare the single stage and dual stage desalting process for crude oil. **[8]**

b) Give the necessity of addition of steam at the furnace inlet before the vacuum distillation unit. Also discuss the dry, wet and damp operations of VDU. **[8]**

OR

Q4) a) Describe a typical fixed bed hydroprocessing unit with a neat diagram. **[8]**

b) Describe the process of 'Exxon DILCHILL' dewaxing. **[8]**

Q5) a) Draw a neat labelled diagram of the FCC unit and discuss the role of regenerator. **[10]**

b) Describe the process of delayed coking with the help of a neat flow sheet. **[8]**

P.T.O

OR

Q6) a) What is bitumen? Give the composition of bitumen. Draw a neat flow sheet for the process of air blowing of bitumen. **[10]**

b) Explain in detail with a diagram, how the SCOT process for sulphur recovery differs from the Claus process. **[8]**

SECTION - II

Q7) a) Describe in brief the recovery of hydrogen by cryogenic phase separation and adsorption. **[8]**

b) Write a note on xylene isomerization. **[8]**

OR

Q8) a) Discuss the process of hydrodealkylation for converting toluene to benzene. **[8]**

b) Explain the various reactions that take place during catalytic reforming. **[8]**

Q9) a) Describe in brief the manufacture of urea formaldehyde resin. **[8]**

b) Give the various process technologies for the manufacture of polyethylene. **[8]**

OR

Q10) a) Give the uses of each of the following: **[8]**

i) Polypropylene.

ii) Polyvinyl chloride.

iii) Polystyrene.

iv) Melamine formaldehyde.

b) Describe in brief the various characteristics of polymers. **[8]**

Q11) a) Give the process steps involved in the manufacture of nylon - 6. **[9]**

b) Describe the process of manufacture of polyester from dimethyl terephthalate (DMT). **[9]**

OR

Q12) a) Give the various routes for the manufacture of terephthalic acid (TPA). Describe the Mobil process for the manufacture of TPA in brief. **[9]**

b) What are synthetic fibres? Name few of them along with their monomers. **[9]**

Total No. of Questions : 12]

SEAT No. :

P1132

[Total No. of Pages : 3

[4163] - 335

T.E. (Polymer Engineering)

MASS TRANSFER & REACTION ENGINEERING

(2008 Pattern) (Sem. - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer three questions from Section - I & three questions from Section - II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Draw neat diagrams wherever necessay.***
4) ***Numbers to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***
6) ***Use of logarithmic table, electronic pocket calculators is allowed.***

SECTION - I

Q1) a) Explain the term mass transfer and give any two examples of mass transfer and explain Fick's Law of Diffusion. **[8]**

b) Explain the terms flux and Diffusivity. Derive the expression for Steady State diffusion of gas A through non-diffusing gas B. **[10]**

OR

Q2) a) Find $D_{N2\text{-Gas mix}}$ if the gas mixture composition by volume % is as follows: $N_2 = 67\%$, $CO_2 = 16\%$, $CO = 11\%$, $O_2 = 6\%$ at 373 ºK, 1.5 atm pressures Data: **[8]**

$D_{N2 - O2} = 18.15 \times 10^{-6}$ m²/sec at 373 ºK, 1.5 atm pressure.

$D_{N2 - CO} = 19.15 \times 10^{-6}$ m²/sec at 373 ºK, 1.5 atm pressure.

$D_{N2 - CO2} = 15.15 \times 10^{-6}$ m²/sec at 373 ºK, 1.5 atm pressure.

b) Explain in detail diffusion through nonporous solids. **[10]**

Carbon monoxide gas is flowing through membrane of polymer, which is 1.2 mm thick. The partial pressure of gas is 100 mm of Hg on one side and negligible on other side under STP conditions. Solubility coefficient is 0.82 cm^3 gas STP/cm^3 atm.

The diffusivity is $1.1*10^{-10}$ m²/sec. Calculate permeability and rate of diffusion.

P.T.O

Q3) a) Explain Raoult's Law and calculate the vapor liquid compositions in equilibrium at 368 ^{o}K for benzene - toluene using the vapor pressure data at 101.32 kPa.
Vapor Pressure of Benzene = 155.7 kPa and Vapor Pressure of Toluene = 63.3 kPa. **[8]**

b) Differentiate between Tray tower and Packed tower. **[8]**

OR

Q4) a) Write a note on minimum liquid to gas ratio for gas absorber. **[8]**

b) Write a note on "Choice of Solvent" for gas Absorption. **[8]**

Q5) a) Discuss in brief the classification of polymer Dryers. **[8]**

b) Discuss in detail with neat diagram Drying of emulsion PVC Polymer. **[8]**

OR

Q6) a) Explain the following terms : Absolute Humidity, Relative Humidity, Saturated Humidity, Percentage Humidity, Adiabatic Saturation. **[8]**

b) Discuss the term Drying - Rate Curve and Total Drying time. **[8]**

SECTION - II

Q7) a) Explain Arrhenius equation and calculate activation energy and frequency factor from the following data: **[8]**

Rate constant K sec^{-1}	43×10^{-5}	717×10^{-5}
Temperature T ^{0}K	313	333

b) Discuss the followings: Order, Molecularity, Rate Constant, first order and second order reaction. **[10]**

OR

Q8) a) Find the reaction rate constant and the time required for 50% conversion of A for the aqueous phase reaction A $\rightarrow$ R proceeds as first order reaction. Assume C_{A0} = 0.05 mol/lit. **[10]**

Time (sec)	780	2080	3540	7200
x_A %	11.2	25.7	36.7	55.2

b) Discuss different factors affecting the reaction rate. **[8]**

Q9) a) Discuss the Integral Method of analysis of kinetics of constant volume batch reactor for the reaction 2A $\rightarrow$ Products. **[8]**

b) Discuss in detail Ideal Batch reactor. **[8]**

OR

Q10) a) The decomposition of N_2O follows second order rate equation. The ratection $2N_2O \rightarrow 2N_2 + O_2$ has a specific rate constant K = 980 cm^3/ gm mole sec at 900^0C. Calculate the fraction decomposed at 1sec, 10sec and 600 sec in a constant volume Batch Reactor. Assume intial $C_{A0} = 1.039 \times 10^{-5}$ gm mol/cm^3. **[8]**

b) Discuss in detail Plug flow reactor. **[8]**

Q11) a) Discuss the Comparison of MFR Vs PFR for carrying out first order reactions. **[8]**

b) Discuss with neat diagram PFR in series. **[8]**

OR

Q12) Write a short note on: **[16]**

a) Different factors to be considered while designing of polymer reactors.

b) N equal - size Mixed Reactors in series.

Total No. of Questions : 12]

SEAT No. :

P1133

[Total No. of Pages : 3

[4163] - 338

T.E. (Polymer Engineering)

INSTRUMENTATION AND PROCESS CONTROL

(2008 Pattern) (Sem. - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from Section - I & any three questions from Section - II.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Draw neat diagrams wherever necessary.***
4) ***Numbers to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***
6) ***Use of logarithmic table, electronic pocket calculators is allowed.***

SECTION - I

Q1) a) Write short note on classification of instruments. **[8]**

b) A voltmeter is calibrated as thermocouples temperatures scale from 0 to 1000°C (Span of Voltmeter is 0-58). The accuracy of voltmeter as specified within ± 0.75 percent of the span. The accuracy of sensor is ± 0.50%. If the scale is showing 515°C what is actual reading? **[6]**

Temp (°c)	500	510	520	530	540
Voltage (mV)	27.393	27.953	28.516	29.080	29.647

c) Explain the different elements of measuring instrument. **[4]**

OR

Q2) a) Describe the following terms in detail. **[12]**

i) Root - square accuracy.

ii) Dead zone.

iii) Fidelity.

iv) Sensitivity.

b) Ultrasonic level detector is used to measure the level of tank. The height of the tank is 10 m. The level detector has the dead zone of 0.50% of the span. What change might occur in the level before it is get detected? **[4]**

c) Write a note on Strain Gauge. **[2]**

P.T.O

Q3) a) Write short note on cold junction compensation of thermocouple. **[8]**

b) Explain the use, advantages and disadvantages of thermal well. **[4]**

c) Explain working principle of thermocouple. **[4]**

OR

Q4) a) Explain different bridges used in the measurement of temperature by RTD. **[7]**

b) Write short note on Bolometer. **[2]**

c) Draw the diagram and explain the principle of manometer with its operating characteristics. **[7]**

Q5) a) With a neat sketch explain construction, working, merits, demerits and applications of turbine flowmeter. **[8]**

b) Name the different mechanical level sensors and explain any one of them in detail. **[8]**

OR

Q6) a) Discuss difference between viscosity measurement of Newtonian and non-Newtonian fluid. **[8]**

b) Write short note on measurement of density. **[8]**

SECTION - II

Q7) a) Differentiate between first order and second order system. Explain with neat diagram Non Interacting and Interacting systems. **[10]**

b) A second order system is observed to exhibit an under damped response giving the Ultimate Value of 26 and Minimum Value of the response = 15. Find the overshoot and Maximum Value of the response for damping coefficient ξ = 0.6, 0.4, 0.2, 0.1 **[8]**

OR

Q8) a) A thermometer which is observed to exhibit the first order dynamics with time constant of 15 sec, which is placed in bath at temperature of 50°C and after reaching steady state, temperature of bath linearly increases with time at 10°C/min. Find out the response of same at time = 5,10,15,20,25,30 min. **[8]**

b) Explain the term Process control and state any three benefits that can be achieved via process control system. Define the term transfer Function and Derive the Transfer Function of First order system. **[10]**

Q9) a) Explain in detail analysis of Stability of feedback control system. **[8]**

b) Discuss Pressure feedback control system with suitable components. **[8]**

OR

Q10) a) Explain with neat diagram the negative feedback control system with one example and compare with the positive feedback system. **[8]**

b) Explain with standard block diagram Open loop Transfer Function and closed loop Transfer Function. **[8]**

Q11) a) Discuss with neat diagrams the modes of Proportional (P), Integral (I) and Derivative (D) control actions and explain the transient response of control system with Proportional Control, Integral Control and Proportional - Integral Control for set point change. **[12]**

b) Discuss with one example Programmable Logic Control. **[4]**

OR

Q12) Write a note on: **[16]**

a) Control of Polymer Processing.

b) Cascade Control.

Total No. of Questions : 12]

SEAT No.:

P1134

[Total No. of Pages : 3

[4163]-341
T.E. (Computer Engg.) (Common To I.T.)
DATABASE MANAGEMENT SYSTEMS
(2008 Pattern) (Sem. - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answers to the two sections must be written in separate books.***
2) ***Assume suitable data if necessary.***
3) ***Solve section-I : Q. 1 or Q. 2, Q. 3 or Q. 4, Q. 5 or Q. 6.***
4) ***Solve section-II : Q. 7 or Q. 8, Q. 9 or Q. 10, Q. 11 or Q. 12.***

SECTION - I

Q1) a) Compare various data models. **[10]**

b) Explain in detail the different levels of data abstraction. **[4]**

c) Compare DBMS and file processing system with following points. **[4]**

i) Redundancy.

ii) Access Control.

OR

Q2) a) What is difference between specialization and generalization? Why do we not display this difference in schema diagram. **[6]**

b) Specify the CODD's norms to be specified by RDBMS. **[6]**

c) What are the enhancements that distinguish the EER model from the ER Model? Explain with example. **[6]**

Q3) a) Consider following relational database employee **[8]**

(emp _ name, street, city).

Works (emp _ name, company _ name, salary).

Company (company _ name, city).

Manages (emp _ name, manager _ name).

For each of the given query, given expression in relational algebra.

i) Find emp _ name, street and cities of residence whose salary exists in between 30,000 to 40,000 and work for XYZ Ltd.

ii) Find the name, street and cities of employees who live in the same city as the company they work for.

P.T.O.

b) Write a short note on dynamic and embided SQL. **[8]**

OR

Q4) a) Explain stored procedures and triggers. **[8]**

b) Explain create, Insert, update and delete operations with respective to views. **[8]**

Q5) a) Let R = (A, B, C, D, E) and let M be the following set of multivalued dependencies A $\twoheadrightarrow$ BC, B $\twoheadrightarrow$ CD, E $\twoheadrightarrow$ AD.

List the non-trivial dependencies in M^+. **[8]**

b) Explain why 4NF is more desirable than BCNF. Rewrite the definition of 4NF and BCNF using the notions of domain constraints. **[8]**

OR

Q6) a) What is decomposition? Suppose that we decompose the schema R = (A, B, C, D, E) into (A, B, C) and (A, D, E), show that this decomposition is a lossless decomposition if the following set F of functional dependencies holds.

A $\rightarrow$ BC, CD $\rightarrow$ E, B $\rightarrow$ D, E $\rightarrow$ A. **[8]**

b) Describe the concept of Transitive dependency and explain how this concept is used to define 3NF. **[8]**

SECTION - II

Q7) a) Explain in detail use of B-Tree as an indexing technique. Compare B-Tree and B^+-Tree. **[8]**

b) Explain roll of "selection" operation in query processing. **[6]**

c) How cost of query is measured? **[4]**

OR

Q8) a) What are the steps involved in query Processing? Explain each in brief. **[8]**

b) What are the various techniques to handle variable length records? Explain any one in details. **[8]**

c) Define Dense index. **[2]**

Q9) a) Explain the concept of 'Transaction'. Describe ACID properties for transaction. **[8]**

b) Explain deferred database modifications and immediate database modifications and their difference in the context of recovery. **[8]**

OR

Q10) a) Explain two phase locking protocol. How does it insure serializability. **[8]**

b) Explain recoverable and cascadeless schedules. **[8]**

Q11) a) Explain how persistant pointer is implimented, compare this implimentation with that of pointers as they exists in general purpose language such as 'C'. **[8]**

b) Specify advantages and disadvantages of distributed database system. **[8]**

OR

Q12) a) Write a short note on <u>any two</u> : **[12]**

i) Pointers swizzling techniques.

ii) Persistant programming language.

iii) Association rules for data mining.

b) Explain the need of book up and replication. **[4]**

Total No. of Questions : 12]

SEAT No.:

P1136

[Total No. of Pages : 3

[4163]-343
T.E. (Computer Engineering)
MICROPROCESSOR AND MICROCONTROLLER
(2008 Pattern) (Sem. - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***In section-I, attempt Q. No. 1 or Q. No. 2, Q. No. 3 or Q. No. 4, Q. No. 5 or Q. No. 6.***
2) ***In section-II, attempt Q. No. 7 or Q. No. 8, Q. No. 9 or Q. No. 10, Q. No. 11 or Q. No. 12.***
3) ***Answers to the two sections should be written in two separate books.***
4) ***Neat diagrams must drawn wherever necessary.***
5) ***Figures to the right indicate full marks.***
6) ***Assume suitable data if necessary.***

SECTION - I

Q1) a) With the help of block diagram, explain super-scalar architecture of Pentium Processor. **[8]**

b) What is the function of each of the following pins. **[6]**

i) $\overline{\text{PBGNT}}$.

ii) $\overline{\text{PEN}}$.

iii) $\overline{\text{PCHK}}$.

c) Describe the floating point data types in Pentium. **[4]**

OR

Q2) a) Explain instruction and data cache organization of Pentium. **[6]**

b) Compare 80386, 80486 and Pentium based on architecture. **[6]**

c) Explain Pentium RISC Features. **[6]**

Q3) a) Draw and explain timing diagram of pipelined read cycle of Pentium processor. **[8]**

b) Describe following addressing modes in Pentium with suitable examples. **[8]**

i) Direct addressing.
ii) Based Addressing.
iii) Based indexed with displacement addressing.
iv) Port addressing.

P.T.O.

OR

Q4) a) Draw and explain memory interfacing mechanism for 32 bit and 16 bit memory with Pentium. **[8]**

b) Explain I/O interfacing and I/O addressing modes of Pentium. **[8]**

Q5) a) How protected mode supports page level protection? Explain in detail. **[8]**

b) Explain TSS Descriptor in protected mode. **[4]**

c) Explain the functions of RPL, CPL, and DPL. **[4]**

OR

Q6) a) Describe logical to linear address translation mechanism of paging in Pentium. **[8]**

b) What is the use of Control Register? Explain significance of CR0 in working of cache and paging unit. **[8]**

SECTION - II

Q7) a) What are the four ways to initiate the task switch? **[8]**

b) What are the IDTR and IDT? How they are related? **[4]**

c) Compare real mode, protected mode and virtual mode. **[4]**

OR

Q8) a) What are the different ways to enter into virtual mode? **[8]**

b) How interrupts are handled in protected mode? Explain with the help of neat diagram. **[8]**

Q9) a) Explain General Purpose (Working Registers) and Special Function Registers in 8051 microcontroller. **[8]**

b) Explain 8051 microcontroller's External Memory and I/O addressing modes. **[8]**

OR

Q10) a) Draw and explain program status word of 8051 microcontroller. **[6]**

b) Explain following program branching instructions of 8051 microcontroller. **[6]**

i) ACALL.
ii) AJMP.
iii) LCALL.

c) Explain interrupt mechanism of 8051 microcontroller. **[4]**

Q11) a) Describe different serial communication modes of 8051 microcontroller. **[8]**

b) Draw and explain Timer Control Register (TCON). **[6]**

c) Explain the features of 8096 microcontroller. **[4]**

OR

Q12) a) Describe Timer Mode 1 and Mode 2 of 8051 microcontroller. **[8]**

b) What are the various SFR you need while programming a serial port? Write a short program to initialize the serial port of 8051 in mode 1 with baud rate 1200 at 12MHZ frequency. **[8]**

c) What is the function of EA and ES pin. **[2]**

Total No. of Questions : 12]

SEAT No.:

P1137

[Total No. of Pages : 3

[4163]-344
T.E. (Computer Engineering)
DIGITAL SIGNAL PROCESSING
(2008 Pattern) (Sem. - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answers to the two sections should be written in separate books.***
2) ***Neat diagrams must be drawn whenever necessary.***
3) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
4) ***Assume suitable data, if necessary.***
5) ***Attempt Q. 1 or Q. 2, Q. 3 or Q. 4, Q. 5 or Q. 6 from Section-I and Q. 7 or Q. 8, Q. 9 or Q. 10, Q. 11 or Q. 12 from Section-II.***

SECTION - I

Q1) a) With illustrations, explain shifting, folding and time scaling operations on discrete-time signals. **[6]**

b) Explain how impulse response can model a system? **[6]**

c) Define : **[6]**

i) Quantization.
ii) Time-Invariant system.
iii) Recursive system.
iv) Power signal.

OR

Q2) a) An analog signal $x(t) = \sin(200\pi t) + 3\cos(250\pi t)$ is sampled at a rate 300 sample/sec. Find the frequency of the DT signal. **[6]**

b) Find the linear convolution of the two signals $x(n) = 3^n\ u\ (-\ n)$;

$$h(n) = \left(\frac{1}{3}\right)^n\ u(n-2).$$ **[6]**

c) Find the following systems are linear or non-linear. **[6]**

i) $y(n) = (n + 1)x(n)$.
ii) $y(n) = 2x(n) + 3$.
iii) $y(n) = x(n^2)$.

P.T.O.

Q3) a) Define Fourier Transform, obtain it for $x(n) = a^n u(n)$, $|a| < 1$ and state necessary conditions for existence of FT. **[8]**

b) State and prove convolution property of DFT. **[8]**

OR

Q4) a) Using Graphical method, obtain a 5 point circular convolution of two DT signals defined as : **[8]**

$x(n) = (1.5)^n, \quad 0 \leq n \leq 2$

$y(n) = 2n - 3, \quad 0 \leq n \leq 3$

b) State and prove following properties of FT. **[8]**

i) Periodicity.

ii) Time shifting.

Q5) a) Derive the relationship between ZT and DFT. Explain the significance of ROC and state the properties of ROC. **[8]**

b) Determine the causal signal $x(n)$ having the Z-Transform $X(z)=\frac{1}{(1+Z^{-1})(1-Z^{-1})^2}$. Using Partial Fraction Expansion method. **[8]**

OR

Q6) a) Find the Z-Transform and plot the ROC of $x(n) = n^2 u(n)$. **[8]**

b) Given $x(n) = \{1, 2, 3, 4, 4, 3, 2, 1\}$, find $X(k)$ using DIT FFT algorithm. **[8]**

SECTION - II

Q7) a) A DT system has transfer function $H(z)=\frac{1+2Z^{-1}}{(1+0.5Z^{-1})(1+3Z^{-1})}$. Give all possible ROCs of this system. State in each case whether the system is stable or unstable. **[6]**

b) Impulse response of a system is given by $h(n) = (0.5)^n \cos\left(\frac{\pi}{4}\right)n$, show pole-zero diagram. **[6]**

c) Obtain response of the system for $y(n) = 0.15x(n) + 0.85\, y(n-1)$, for input $x(n) = u(n)$. **[6]**

OR

Q8) a) How to determine the causality and stability from $H(Z)$, illustrate this with one example. Obtain the magnitude and impulse response for the same. **[10]**

b) Explain how a time domain behavior of a DT causal signal can be described by means of pole-zero location of its Z-Transform. **[8]**

Q9) a) A filter is to be designed with the following desired frequency response.

$$H_d\left(e^{j\omega}\right)=\begin{cases} 0 & \text{for} \quad \dfrac{-\pi}{4}\le\omega\le\dfrac{\pi}{4} \\ e^{-j\omega} & \text{for} \quad \dfrac{\pi}{4}\le\omega\le\pi \end{cases}$$

Determine the filter coefficients $h_d(n)$ if the window function is defined as $W(n)=\begin{cases}1 & \text{for} \quad 0\le n\le 4 \\ 0 & \text{for} \quad \text{otherwise}\end{cases}$ **[8]**

b) What is the principle of impulse invariant method? Explain the mapping between S domain and Z domain for impulse invariant method. Can you convert a stable analog filter into a stable DT filter using this method? **[8]**

OR

Q10) a) Design a DT Butterworth filter for the following specifications using BLT method. The filter is required to have – 3 dB attenuation at a frequency of 1500 Hz and an attenuation of 40 dB at 4000 Hz. The sampling frequency is 10000 Hz. **[8]**

b) What is the use of windowing? Compare characteristics of different window functions. Which is the special feature of Kaiser window? How can you achieve a trade off between side amplitude and transition width. **[8]**

Q11) a) Draw the structure of cascade and parallel realizations of

$$H(Z)=\frac{(1-z^{-1})^3}{(1-\frac{1}{2}z^{-1})(1-\frac{1}{8}z^{-1})}.$$ **[8]**

b) Draw the functional diagram of ADSP 21XX DSP processor. Explain MAC? How can MAC operate faster using program cache? **[8]**

OR

Q12) a) Explain the features of ADSP 21XX processor. What is the use of DAG 1 and DAG 2? How different index registers are used in DAG 1 and DAG 2? **[8]**

b) Explain direct form-I and direct form-II filter structures and compare with respect to memory requirements and computational complexity? **[8]**

Total No. of Questions : 12]

P1138

SEAT No.:

[Total No. of Pages : 4

[4163]-345
T.E. (Computer)
THEORY OF COMPUTATION
(2008 Pattern) (Sem. - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer three questions from each section on separate answer books.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data if necessary and state it clearly.***

SECTION - I

Q1) a) Construct DFA for checking "whether a string over alphabet {*a*, *b*} contains a substring *abb*". **[8]**

b) Construct a DFA equivalent to NFA given below : **[10]**

$M = (\{q_0, q_1, q_2, q_3\}, \{a, b\}, \delta, q_0, \{q_3\})$ where δ is

State/Σ	*a*	*b*
→ q_0	q_0, q_1	q_0
q_1	q_2	q_1
q_2	q_3	q_3
((q_3))	-	q_2

OR

Q2) a) Convert the following Moore machine to Mealy Machine. **[8]**

Present state	Next state		Output
	a = 0	*a* = 1	
→ q_1	q_1	q_2	0
q_2	q_1	q_3	0
q_3	q_1	q_3	1

P.T.O.

b) Construct an NFA and then equivalent DFA accepting strings over {0, 1} for accepting all possible strings of zeros and ones which do not contain 011 as substring. **[8]**

c) Differentiate between NFA and DFA. **[2]**

Q3) a) Using pumping Lemma prove that $L = \{O^n \mid n \text{ is a prime}\}$ is not regular. **[8]**

b) Construct a minimum state automaton equivalent to the FA given below : **[8]**

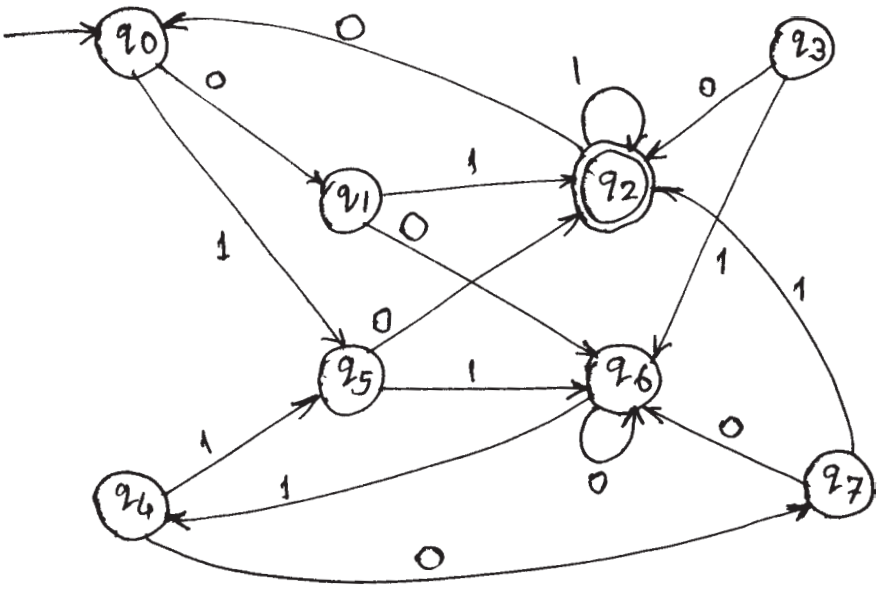
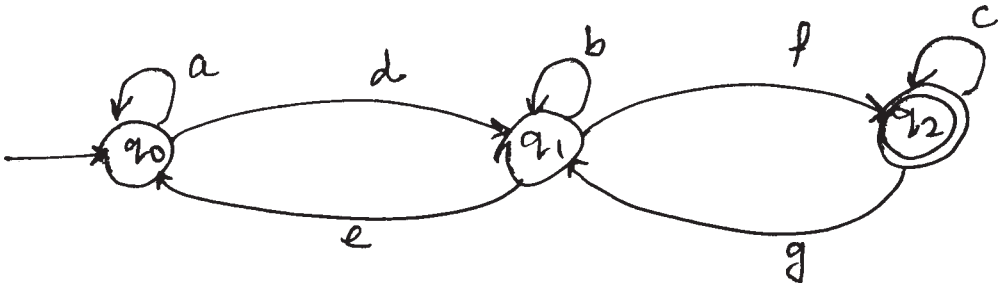


Fig for Q.3 (b)

OR

Q4) a) Construct DFA for the Regular Expression $(a + b)^* abb$. **[6]**

b) Construct Regular Expression for the following transition diagram. **[6]**



c) Explain the use of regular expressions in UNIX with any one example. **[4]**

Q5) a) Given a CFG as : **[8]**

$S \rightarrow aB \mid bA$

$A \rightarrow a \mid aS \mid bAA$

$B \rightarrow b \mid bS \mid a\,BB$

Is ab, baba, abbbaa in L (G)? What is the language of this CFG? Is the CFG ambiguous?

b) Write a grammar G for generating the language $L = \{w \in \{a, b\}^* \mid w$ is an even length palindrome with $|w| > 0\}$. **[8]**

OR

Q6) a) For the right linear grammar given below, obtain an equivalent left linear grammar. **[6]**

$S \rightarrow 10A \mid 01$

$A \rightarrow 00A \mid 1$

b) Describe the language generated by the following grammar. **[6]**

$S \rightarrow bs \mid aA \mid \in$

$A \rightarrow aA \mid bB \mid b$

$B \rightarrow bs$, ($\in$ - epsilon)

c) Convert the following grammar to CNF. **[4]**

$S \rightarrow Aba$

$S \rightarrow aab$

$B \rightarrow Ac$

SECTION - II

Q7) a) Let $L = \{a^n b^n c^m d^m \mid n, m \geq 1\}$. Find a PDA that accepts L by empty stack. **[8]**

b) Describe in brief : **[10]**

i) Regular language and DPDA.

ii) Construction of CFG from PDA.

OR

Q8) a) Construct a PDA accepting $\{a^n b^m a^n \mid n, m \geq 1\}$ by null store. **[8]**

b) Convert the grammar below to PDA. **[10]**

i) $S \rightarrow 0S1 \mid A$

$A \rightarrow 1A0 \mid S \mid \in$

ii) $S \rightarrow 0BB$

$B \rightarrow 0S \mid 1S \mid 0$

Q9) a) Design a Turing Machine to check whether a string over {a, b} contains equal no. of a's and b's. **[8]**

b) i) What is halting problem of Turing Machine? **[8]**

ii) Differentiate between - Finite Automata and PDA.

OR

Q10) a) Describe Universal Turing machine in brief. **[8]**

b) i) What is post machine? How does it differ from Turing Machine?

ii) What is the concept of multi-tape Turing Machine? **[8]**

Q11) a) Explain the Chemsky Hierarchy of grammar and describe the machines that accept each type of grammar. **[8]**

b) Define the following terms : **[8]**

i) Un-decidability.

ii) Post correspondance Problem.

OR

Q12) a) Define recursive and recursively enumerable languages and specify relationship between them. **[8]**

b) Show that for two recursive languages L1 and L2, each of the following is also recursive. **[8]**

i) $L1 \cup L2$.

ii) $L1 \cap L2$.

Total No. of Questions : 12]

SEAT No. :

P1139

[Total No. of Pages : 3

[4163] - 346

T.E. (Computer Engg.)

PRINCIPLES OF PROGRAMMING LANGUAGES

(2008 Pattern) (Sem. - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to candidates:

1) ***Answer three questions from Section - I and three questions from Section - II.***
2) ***Answers to the two sections should be writ ten in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What do you mean by programming paradigms? State key features of following: **[10]**

i) Logic programming.
ii) Functional programming.
iii) Parallel programming.
iv) Concurrent programming.

b) What is the scope, visibility and lifetime of a variable which is **[8]**

i) Static variable.
ii) Extern variable.

OR

Q2) a) Explain difference between recursive call and ordinary call of a program. How recursive subprogram call acts as an important sequence control structure in programming? **[8]**

b) Differentiate between structured and nonstructured data type. **[4]**

c) What do you mean by storage management? Explain static and dynamic storage management. **[6]**

Q3) a) What are the features of procedural programming? How procedures and modularity makes procedural programming as a better choice for programs. **[8]**

b) With suitable example, demonstrate how nested procedures and functions acts as a efficient program design construct. **[8]**

OR

P.T.O

Q4) a) Explain desirable and undesirable characteristics of procedural programming. **[8]**

b) What are parameter passing techniques used in PASCAL? Explain with example. **[8]**

Q5) a) What are advantages and disadvantages of inheritance in Java. **[4]**

b) What is difference between pointer and references with reference to object oriented programming. **[6]**

c) With suitable examples, demonstrate the role of various predefined exception classes in Java. **[6]**

OR

Q6) a) Explain following kinds of variables supported by Java. **[8]**

i) Instance variable.
ii) Static variable.
iii) Local variable.
iv) Parameter variable.

b) What do you mean by package/List and explain in brief standard Java packages. **[4]**

c) Explain the use of JDBC in socket programming. **[4]**

SECTION - II

Q7) a) Explain in brief following constructs with respect to .NET framework. **[8]**

i) Arrays.
ii) Interfaces.
iii) Event handler.
iv) Delegates.

b) Explain value type and reference type variable with respect to C#. **[6]**

c) Describe the structure of C # program. **[4]**

OR

Q8) a) Explain early binding and late binding with example. **[6]**

b) What is Microsoft .NET technology? What are web services and their importance from business perspective? List web services protocols supported by industry. **[10]**

c) Explain significance of Namespaces with respect to C#. **[2]**

Q9) a) What are different searching techniques supported by logic programming. **[8]**

b) Why recursions are so naturally applies to defining relations in PROLOG? Justify with suitable example. **[4]**

c) Write a short note on Prolog facilities and deficiencies. **[4]**

OR

Q10) a) Describe the control structure of Prolog with example. **[6]**

b) Write a short note on applications of Logic programming. **[4]**

c) How resolution and unification algorithm works to match the proper pair in database to achieve the goal? Explain with suitable example. **[6]**

Q11) a) Write short note on Free and Bound identifiers support with respect to Lambda calculus. **[6]**

b) Explain Shallow binding and Deep binding with respect to LISP. **[6]**

c) What is output of following LISP functions. **[4]**

i) (setq a(cons ‘b(cons ‘c nil)))

ii) (cdar ‘((a b) c d e))

iii) (not (and (eq (+ 1 2)3) (< 4 3) (/5 0)))

iv) (mapcar ‘atom’ ‘(1 2 (a b) 3))

OR

Q12) a) Write a LISP program to compute the nth Fibonacci number (i.e. 1,1,2,3,5,8,13,.....) **[4]**

b) State and explain key features and design goals of LISP. **[4]**

c) Explain following expression evaluation techniques with proper examples. **[8]**

i) Innermost evaluation.

ii) Selective evaluation.

iii) Outermost evaluation.

iv) Short circuit evaluation.

Total No. of Questions : 12]

SEAT No. :

P1140

[Total No. of Pages : 3

[4163] - 347
T.E. (Computer Engg.)
COMPUTER NETWORKS
(2008 Pattern) (Sem. - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Assume that you are accessing a mail through a browser on a computer. Explain step by step various things happen at various layers on client side computer and server side. Assume both uses TCP/IP protocol stack. **[8]**

b) State and explain any three HTTP methods. **[8]**

OR

Q2) a) Comment on the importance of DNS. Explain with suitable example how query resolving process is done? **[8]**

b) Explain in brief functionality of DHCP server, Proxy server, Mail server. **[8]**

Q3) a) Draw and explain 3-way handshake process of TCP. **[6]**

b) Draw UDP header structure, Explain significance of each field in UDP header. What is pseudo-header. **[6]**

c) Explain multiplexing and de-multiplexing in transport layer. **[6]**

OR

Q4) a) Explain significance of following flags in TCP header SYN, RST, FIN, PSH. **[6]**

b) What is socket? List and explain various socket primitives required in UDP socket program on client and server side. **[6]**

c) Explain error control and flow control in TCP. **[6]**

P.T.O

Q5) a) Describe in brief Integrated Services and Differentiated Services. **[8]**

b) What is congestion? List various network parameters affected due to congestion. **[8]**

OR

Q6) a) Describe any link scheduling algorithm. **[8]**

b) Describe TCP congestion control approach. **[8]**

SECTION - II

Q7) a) Describe in short the importance and working of following commands. **[8]**

i) Ping.

ii) Netstat.

iii) Traceroute.

iv) Ipconfig.

b) Describe working of ARP with suitable example. What is Inverse ARP? **[8]**

OR

Q8) a) Consider a class-C network which needs to be subnetted into 4 subnets. Calculate the appropriate network mask. How many number of hosts can be supported by each subnet. **[8]**

b) What is ICMP? Write a note on ICMP messages. **[8]**

Q9) a) A router is networking four different networks with network addresses 180.70.65.192/26, 180.70.65.128/25, 201.4.22.0/24, 201.4.16.0/22 and default router on 180.70.65.200 make a routing table for this router and explain the forwarding process for packet with destination IP 18.24.32.78. **[10]**

b) What is AS? What are Intra Domain routing protocols? Explain one Inter Domain routing protocol. **[6]**

OR

Q10) a) Explain in detail working principal behind Distance Vector and Link State routing. **[10]**

b) Define the terms Interior Gateway Protocol and Exterior Gateway protocol with suitable example. **[6]**

Q11) a) What is PPP? Draw and discuss PPP state transition diagram. **[8]**

b) Write a short note on any two: **[10]**

i) ATM.

ii) TDMA.

iii) LAN bridges.

OR

Q12) a) What is link control? Discuss HDLC frame format. **[8]**

b) Write a short note on any two: **[10]**

i) Frame Relay.

ii) CDMA.

iii) IEEE 802.3

Total No. of Questions : 12]

SEAT No.:

P1145

[Total No. of Pages : 4

[4163]-352
T.E. (Information Technology)
THEORY OF COMPUTATION
(2008 Pattern) (Sem. - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer Question 1 or 2, 3 or 4, and 5 or 6 from section-I and Question 7 or 8, 9 or 10, and 11 or 12 from section-II.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data if necessary.***

SECTION - I

Q1) a) Define and explain : **[8]**

i) Regular expression.
ii) Alphabet.
iii) Finite Automata.
iv) Relation and its properties.

b) Design a Finite State Machine for divisibility by 3 tester of given decimal number. **[8]**

OR

Q2) a) Construct NFA from the following regular expression. **[8]**

i) $(ab + ba)^+$.
ii) $(a + b)^* ab$.

b) Design a FA that reads strings made up of letters in the word "CHARIOT" that recognize those string that contain the word 'CAT' as a substring. **[8]**

Q3) a) Define FSM equivalence? Explain Moore's algorithm with the help of example. **[8]**

P.T.O.

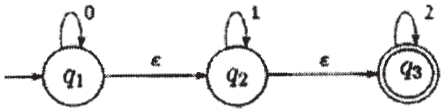
b) Consider the following ε-NFA. **[8]**

	ε	a	b	c
→p	ϕ	{p}	{q}	{r}
q	{p}	{q}	{r}	ϕ
r*	{q}	{r}	ϕ	{p}

i) Compute the ε-closure of each state.
ii) Convert the automaton to DFA.

OR

Q4) a) Convert NFA with ε-moves to equivalent NFA without ε-moves. **[8]**



b) Construct DFA equivalent to NFA. **[8]**
({p, q, r, s, t}, {0, 1}, δ, p, {s, t}) where

δ =	0	1
→p	{p, q}	{p}
q	{r, s}	{t}
r	{p, r}	{t}
s*	ϕ	ϕ
t*	ϕ	ϕ

Q5) a) Define and explain Grammar. **[2]**

b) Let G be the grammar. **[8]**

S → aB | bA
A → a | aS | bAA
B → b | bS | aBB

for string aaabba bbba

i) Find leftmost and rightmost derivation.
ii) Check the grammar is ambiguous or not?

c) Convert the following grammar to Chomsky Normal Form (CNF). **[8]**

S → ABA
A → aA | ε
B → bB | ε

OR

Q6) a) Convert the following grammar to GNF. **[9]**

G = ({A1, A2, A3}, {a, b}, P, A1)

P = {A1 → A2A3

A2 → A3A1 | b

A3 → A1A2 | a}

b) Write a note on : **[9]**

i) Removal of useless symbols.

ii) Removal of unit productions.

iii) Removal of ε productions.

SECTION - II

Q7) a) By using Pumping Lemma, prove that following language L = {1^p | p is a prime number} is not a context-free language. **[8]**

b) Give the left linear grammar for the regular expression (10)* 1. **[4]**

c) Give the right linear grammar for the regular expression 0*1 (0 + 1)*. **[4]**

OR

Q8) a) State and prove Pumping lemma theorem for Context-Free Languages. **[8]**

b) Convert the following right linear grammar to left linear grammar - **[4]**

S → bB

B → bC

B → aB

B → b

C → a

c) Construct finite automaton for following left linear grammar - **[4]**

S → X0 | Y1

X → Y1

X → Y0 | 1

Q9) a) Obtain a PDA to accept a string of balanced parentheses. The parentheses to be considered are (,), [,]. **[8]**

b) For the grammar - **[8]**

S → aABB | aAA

A → aBB | a

B → bBB | A

C → a

Obtain the corresponding PDA.

OR

Q10) a) Obtain a PDA to accept the language $L = \{a^n b^{2n} \mid n \geq 1\}$. **[8]**

b) Explain with example DPDA and NDPDA. **[8]**

Q11) a) Construct a Turing Machine to accept the following language $L = \{0^n 1^n 2^n \mid n \geq 1\}$. **[10]**

b) Write short notes on : **[8]**

i) Multidimensional TM.

ii) Halting problem of TM.

OR

Q12) a) Design a Turing Machine to multiply two unary numbers. **[10]**

b) Write short notes on : **[8]**

i) Nondeterministic TM.

ii) Acceptance of language by TM.

Total No. of Questions : 12]

SEAT No. :

P1146

[Total No. of Pages : 2

[4163] - 353

T.E. (Information Technology)

COMPUTER NETWORK TECHNOLOGY

(2008 Pattern) (Sem. - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer 3 questions from each section.***
2) ***Answers to the two sections should be writtten in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain with example: **[10]**

i) Hierarchical routing Algorithm,

ii) Link State routing Algorithm.

b) Explain the difference between interdomain and intradomain routing protocols with example. **[8]**

OR

Q2) a) Differentiate among circuit switching, packet switching and message switching. Give at least one example. **[9]**

b) What do you mean by congestion? Explain any two congestion control algorithms in virtual circuit subnets. **[9]**

Q3) a) What is fragmentation? Explain types of fragmentation with example. **[8]**

b) Compare between IPv4 and IPv6. **[8]**

OR

Q4) a) What is NAT? Explain its operation with an example. **[8]**

b) Consider any class-B network with default subnet mask. How many actual hosts can be connected in that network? Divide that network into 8 equal subnets? **[8]**

What is the new subnet mask?

What is the starting address of the 4^{th} Subnet?

What is the last address of the 4^{th} Subnet?

How many hosts can be connected in each subnet? (Give all details).

P.T.O

Q5) a) Explain the three way handshake algorithm for TCP connection establishment. **[8]**

b) What is silly window syndrome? How to overcome it? **[8]**

OR

Q6) a) What is a Socket? Explain various socket primitives used in client - server interaction. **[8]**

b) What do you mean by flow control in transport layer? What are the different methods to achieve it? **[8]**

SECTION - II

Q7) a) What is cookie? Where and how it is used? **[6]**

b) Explain at least 6 commands of FTP in brief. **[6]**

c) Differentiate between FTP and TFTP. **[6]**

OR

Q8) a) List the four areas of network management and explain the necessity of each. **[8]**

b) Explain persistent and non-persistent HTTP Connection. **[10]**

Q9) a) Explain the RTSP protocol. Why this protocol is needed. **[8]**

b) Differentiate between SIP and H.323 protocol. **[8]**

OR

Q10) a) What is MIB? Explain its structure. **[8]**

b) Explain Round Robin and Weighted Fair Queuing algorithm for scheduling. **[8]**

Q11) a) Discuss various layers used in ATM architecture. **[8]**

b) Explain Bluetooth architecture with diagram. **[8]**

OR

Q12) Write a short note on: **[16]**

a) Limitations of Bluetooth.

b) ATM protocol stack.

c) Frame Relay.

Total No. of Questions : 12]

SEAT No. :

P1147

[Total No. of Pages : 3

[4163] - 354
T.E. (IT)
SOFTWARE ENGINEERING
(2008 Pattern) (Sem. - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to candidates:

1) ***Answer three questions from Section - I and three questions from Section - II.***
2) ***Answers to the two sections should be writtten in separate books.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What is software Engineering? What are the characteristics of software? Explain in detail following software myths. **[10]**

i) Management myths.

ii) Practitioner's myths.

b) Explain in detail the following models. **[8]**

i) Incremental model.

ii) Prototyping model.

OR

Q2) a) What is software process? What are framework and umbrella activities? Explain in detail all the process phases of waterfall process model and state merits/demerits of the same. **[10]**

b) Explain in detail the Rational Unified Process. **[8]**

Q3) a) What is meant by normal and exciting requirements? How requirements are validated? **[8]**

b) List all the rules of thumb. Explain in detail following UML diagrams stating purpose and applicability. **[8]**

i) Use - case diagram.

ii) Activity diagram.

OR

P.T.O

Q4) a) Draw level 0, level 1, and level 2 data flow diagram for Hospital management system. The system keeps track of patients, nurses, doctors, wards, operation theatre and bills. The system generates reports on demand. **[10]**

b) Explain various stakeholders involved in the project along with their viewpoints. **[6]**

Q5) a) What are the elements of design model? What are the elements of architectural design? What is the importance of software design? **[8]**

b) Explain the Golden rules used for user interface design. **[8]**

OR

Q6) a) Explain the web design pyramid. What are interface design principles for web application? **[8]**

b) Explain all architectures styles in details. **[8]**

SECTION - II

Q7) a) Explain following system testing types: **[8]**

i) Recovery testing.

ii) Security testing.

iii) Stress testing.

iv) Performance testing.

b) What is black box testing? What are the ways to perform black box testing? **[8]**

OR

Q8) a) What is difference between testing and debugging? Explain in detail debugging process. **[8]**

b) What are the testing strategies for web application? Explain the testing process for web application. **[8]**

Q9) a) What are the 4 Ps involved in software project management? Explain the W5HH principles. **[8]**

b) Define the term 'software scope'. Write short note on make by decision. **[8]**

OR

Q10) a) What factors should be considered when planning the structure of software engineering teams? What are the organizational paradigms for software engineering teams? **[8]**

b) Describe in detail the project estimation with use - cases. What are its pitfalls? **[8]**

Q11) a) Define software risk. Explain various types of risks with suitable example. Explain risk management process. **[10]**

b) What are elements that exist when an effective SCM system is implemented? Explain each in detail. **[8]**

OR

Q12) Write short notes on: **[18]**

a) Software quality assurance (SQA).

b) Change control process.

c) Earned value analysis.

Total No. of Questions : 12]

SEAT No. :

P1148

[Total No. of Pages : 3

[4163] - 355

T.E. (Information Technology)

SYSTEM SOFTWARE PROGRAMMING

(2008 Pattern) (Sem. - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***In Section I, attempt Q.No.1 or Q.No.2, Q.No.3 or Q.No.4, Q.No.5 or Q.No.6.***
2) ***In Section II, attempt Q.No.7 or Q.No.8, Q.No.9 or Q.No.10, Q.No.11 or Q.No.12.***
3) ***Answers to the two sections should be written in two separate books.***
4) ***Neat diagrams must be drawn wherever necessary.***
5) ***Figures to the right indicate full marks.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Write an algorithm for Pass-I of two pass Assembler and explain with suitable example. **[12]**

b) Give the difference between Literal and Symbol. How these are treated by Assembler. **[6]**

OR

Q2) a) For the following assembly code generate Literal table, Symbol Table, Pool Table, Intermediate Code, Assume size of instruction is equal to one byte. **[10]**

```
        START 200
        MOVER AREG, A
L :     MOVEM BREG, = '2'
        ADD BREG, = '2'
        ADD CREG, = '3'
        ORIGIN L + 20
        LTORG
        MOVER AREG, C
        C EQU L + 15
        ADD AREG, = '2'
        ADD BREG, = '5'
        A DS 5
        END
```

P.T.O

b) Explain forward referencing and back - patching with reference to single Pass Assembler with suitable example. **[8]**

Q3) a) Write an algorithm for Pass - I of two pass Macro Processor with suitable example. **[10]**

b) What are the different ways in which we can specify the arguments to a Macro call? Briefly explain with the help of suitable example. **[6]**

OR

Q4) a) Write an example for a Macro Calls within Macro definitions, for this example (input source) Show the contents of Macro Definition Table and Macro Name Table. **[12]**

b) Compare Macro and Subroutine. **[4]**

Q5) a) What is Lexical Analysis? Enlist the various data structures used in Lexical Analysis. Give the format of each data structures with suitable example. **[10]**

b) With the help of suitable example explain the problem of left recursion in Top down Parser. **[6]**

OR

Q6) a) Consider the following Grammar. **[6]**

S -> aABe

A -> Abc | b

B -> d

Show stepwise procedure for recognizing the input string "abbcde" using Bottom up parsing technique.

b) What do you mean by Top down Parser? Explain with suitable example. **[6]**

c) What are the basic tasks of Scanner? **[4]**

SECTION - II

Q7) a) For the statement given below, generate intermediate code in the format. **[8]**

i) Postfix notation.

ii) Parse tree.

iii) Quadruple.

iv) Triple.

s = (a + b) / (c – d)

b) What are the issues in code generation? **[8]**

OR

Q8) a) Explain in brief machine Independent optimization techniques. **[12]**

b) What is the need for generating intermediate code? Explain. **[4]**

Q9) a) Explain compile and Go loader scheme. **[6]**

b) What is loader? Enlist the basic functions of a loader. **[6]**

c) Differentiate between absolute loader and relocating loader. **[6]**

OR

Q10) a) Draw the flow chart for Pass II of direct linking loader. **[12]**

b) Explain: **[6]**

i) Overlay structure,

ii) Linkage editor.

Q11) a) Explain the following language processor tools. **[8]**

i) LEX.

ii) YACC.

b) State merits & demerits of Line & Screen editors, with example. **[8]**

OR

Q12) a) Explain in detail typical editor structure. **[8]**

b) What is the importance of User Interface in system software development? Explain. **[4]**

c) Write the significance of Debug Monitor. **[4]**

Total No. of Questions : 12]

SEAT No. :

P1154

[Total No. of Pages : 3

[4163] - 364
T.E. (Biotechnology)
COMPUTATIONAL TECHNIQUES AND BIOSTATISTICS
(2008 Pattern) (Sem. - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from Section - I & any three questions from Section - II.***
2) ***Figures to the right indicate full marks.***
3) ***Use of programmable calculator is not allowed.***
4) ***Draw a neat sketch wherever necessary.***
5) ***Make necessary assumptions wherever required.***

SECTION - I

Q1) a) Find the constants "a" and "b" by least squares method using following data: **[8]**

Data : $y = ae^{bx}$

x	2	4	6	8	10
y	4.077	11.084	30.128	81.897	222.62

b) The following values of "T" and "1" follow the law $T = al^n$. Find the best value of "a" and "n". **[8]**

T	1	1.5	2	2.5
1	25	56.2	100	1.56

OR

Q2) a) The following table gives the data of the train resistance R, and velocity V. R is related to V by the equation $R = a + bV + cV^2$. Find "a", "b" and "c". **[8]**

V	20	40	60	80	100	120
R	5.5	9.1	14.9	22.8	33.3	46.0

b) An experiment gave the following values. The constants are related by the equation $y = ax^b$. Find "a" and "b". **[8]**

y	350	400	500	600
x	61	26	7	26

P.T.O

Q3) The table gives the value of tan x for $0.10 \le x \le 0.30$. Find by Newton's interpolation formulae. **[16]**

x	0.10	0.15	0.20	0.25	0.30
y	0.1003	0.1511	0.2027	0.2553	0.3093

a) *tan* 0.12.

b) *tan* 0.26.

c) *tan* 0.40.

d) *tan* 0.50.

OR

Q4) a) Certain corresponding values $\log_{10} x$ are (300,2.4771), (304,2.4829), (305,2.4843), (307,2.4871). Find $\log_{10} 301$ by Newton's Forward interpolation formula. **[8]**

b) Define the operators Δ, ∇, δ, ε. Show that **[8]**

i) $\varepsilon = 1 + \Delta$.

ii) $(\varepsilon - 1)^3 y_0 = y_3 - 3y_2 + 3y_1 - y_0$.

Q5) Apply Trapezoidal rule and Simpson's 1/3rd rule to evaluate the integral $\int_0^1 \sqrt{1 - x2\,dx}$. **[18]**

OR

Q6) Deduct the following: **[18]**

a) Newton cotes quadratic formula.

b) Weddle's rule.

SECTION - II

Q7) a) Using Newton's iterative method, find the real root of **[9]**

$x^2 + y^2 = 13, x^2 - y^2 = 3$.

b) Given that the equation $x^{2.2} = 69$ has a root between 5 and 8. Use the method of Regula falsi method to determine it. **[9]**

OR

Q8) a) Find a root of the equation $xe^x = 1$ using bisection method. **[9]**

b) By Newton Raphson's iterative formula find a root of $x \sin x = -\cos x$. **[9]**

Q9) a) Explain in brief general rules for constructing a table. **[8]**

b) Write short notes on Sampling errors. **[8]**

OR

Q10) a) Write short notes on: **[8]**

i) Judgment sampling.

ii) Cluster sampling.

b) Write short notes on: **[8]**

i) Deviation bars.

ii) Percentage bar diagrams.

Q11) In a cross breeding experiment with plants at certain species 240 offspring were classified into 4 classes with respect to the structure of their leaves as follows. According to the theory of heredity, the probability of four classes should be in the ratio 1:9:3:3. Are these data consistent with the theory? Use 5% value of χ^2 for 3 degrees of freedom = 7.82. **[16]**

Class	I	II	III	IV	Total
Frequency	21	127	40	52	240

OR

Q12) For a random sample of 10 girls fed on American diet, the increased weight in pounds in a certain period were : **[16]**

10 , 6, 16, 17, 13, 12, 8, 14, 15, 9

For another random sample of 12 girls fed on Indian diet B, the increases in the same period were:

7 , 13, 22, 15, 12, 14, 18, 21, 23, 10, 17

Test whether the diets differ significantly as regards on increase in weight.

Degrees of freedom : 19 20 21 22 23

Value of t at 5% level : 2.09 2.09 2.08 2.07 2.07

Total No. of Questions : 12]

SEAT No. :

P1490

[Total No. of Pages : 4

[4163]-323
T.E. (Petro Chemical)
MASS TRANSFER - I
(2008 Pattern) (Sem. - I)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data if necessary.***

SECTION - I

Q1) Answer the following questions in brief : **[18]**

a) Give the relationship between mass transfer coefficient and diffusivity.

b) Describe a method to estimate the diffusivity of a volatile solvent into air.

c) State and explain Fick's Law. Give meaning of all terms involved in it.

d) Explain with suitable graph the moisture content in the solid.

OR

Q2) a) Derive an expression for finding the mass flux of diffusion of A through B, for equimolar counter diffusion. A and B are liquids. **[9]**

b) Gas A is diffusing from a gas stream at point 1 to a catalyst surface at point 2 and reacts instantaneously and irreversibly as follows: $2A \rightarrow B$. Gas B diffuses back to the gas stream. Derive the final equation for NA at constant pressure P and steady state in terms of partial pressure. **[9]**

Q3) An ethanol (A) - water (B) solution in the form of a stagnant film 2 mm thick at 295 K is in constant at one surface with an organic solvent in which ethanol is soluble and water is insoluble. (Hence $N_B = 0$). At point 1, the concentration of ethanol is 16.8-weight % and solution density, $\rho_1 = 975$ kg/m^3, At point 2, the concentration of ethanol is 7 weight % and $\rho_2 = 990$ kg/m^3. The diffusivity of ethanol is 0.750×10^{-9}m^2/sec. Calculate the steady-state flux N_A. **[16]**

OR

P.T.O.

Q4) H_2 gas flows through a tube of neoprene rubber having ID = 30 mm and OD = 58 mm. The pressure and temperature of the gas are 3 std. atm. pressure and 298 K respectively. If the solubility of hydrogen in rubber is $S = 50 \times 10^{-3} \frac{m^3(\text{NTP})}{m^3.\text{rubber.atm.}}$ and diffusivity of H_2 through rubber $D_{AB} = 1.9 \times 10^{-10} m^2/\text{sec}$. Calculate rate of H_2 loss per unit length of tube due to diffusion. **[16]**

Q5) a) Show that for the absorption of a soluble gas, from a mixture with a non-soluble gas, into a liquid:

$\frac{1}{K_G} = \frac{1}{K_G} + \frac{H}{K_L}$, where the symbols have their usual meaning. Hence indicate the conditions under which either the gas or liquid films can become the controlling factor in the overall rate. **[8]**

b) Discuss in brief various mass transfer theories proposed by various researchers to study interphase mass transfer. **[8]**

OR

Q6) a) Ammonia is absorbed by water in a wetted-wall column being operated at 20ºC and 1 std. atm. The overall gas coefficient is 1K mole $NH_3/[(m^2)$ (std. atm.)]. At one point in the column, the gas contains 10-mole% ammonia and the liquid phase contains 0.155 mole ammonia per m^3 of solution. 96% of the total resistance is in the gas phase. Assume Henry's law constant at 293 K = 4.247×10^{-3} std.atm./(mole NH_3/m^3 solution). Determine the interfacial film coefficient and the interfacial compositions. **[8]**

b) Develop the material balance equations for counter current mass transfer process by giving the graphical representations of the final equation. **[8]**

SECTION - II

Q7) If the local Nusselt number for the laminar boundary layer that is formed over a flat plate is $Nu_x = 0.332\ Re_x^{1/2}\ Sc^{1/3}$.

Obtain an expression for the average film-transfer coefficient k_c, when the Reynolds number for the plate is :

a) ReL = 100000

b) ReL = 1500000

The transition from laminar to turbulent flow occurs at $Re_x = 3 \times 10^5$. **[18]**

OR

Q8) The average heat transfer coefficient for natural convection from a single sphere in a large body of fluid is given by

$$\frac{hd}{k} = 2 + 0.6\left(\frac{d^3\rho^2 g\beta\beta\Delta}{\mu^2}\right)^{1/4}\left(\frac{{}^{c}p\mu}{k}\right)^{1/3} \quad \text{for } Gr^{1/4}Pr^{1/3} < 200$$

Where *d* is the diameter of the sphere and the fluid properties are evaluated at the mean temperature of the sphere and bulk fluid. Using the analogy between mass and heat transfer, calculate the instantaneous rate of sublimation at the surface of a naphthalene sphere in air at 145ºC and 1 atm. **[18]**

Explain the analogy between N*u* = S*h*, S*c* = P*r*, G*r* = Gr_{AB}

Data :

$P^{vap}_{naphthalene}$ = 0.2 atm, $D_{AB} = 5.8 \times 10^{-6}$ m^2/s, $d = 9 \times 10^{-2}$m

$\rho_{air} = 0.85$ kg/m^3, $\mu_{air} = 2.5 \times 10^{-5}$ kg/m.s

Q9) a) For equimolar counter-diffusion from a sphere to a surrounding stationary infinite medium, the mass flux N_{Ai} of the diffusing component A at the interface is given by $N_{Ai} = D_A (C_{Ai} - C_{Ab})/R$ where D_A is the diffusivity, R the radius of the sphere and C_{Ai} and C_{Ab} the molar concentrations of A at the interface and at a point far away from the sphere. Show that the Sherwood number, based on the diameter of the sphere, is equal to 2. **[6]**

b) It is desired to dry a certain type of fibre board in sheets 0.13 meter by 0.16 meter by 0.07 meter from 55% to 5% moisture (wet basis) content. Initially from laboratory test data with this fibre board, the rate of drying at constant rate period was found to be 8.75 kg/m^2 hour. The critical moisture content was 26.9% and the equilibrium moisture content was 1%. The fibre board is to be dried from one side only and has a bone-dry density of 240 kg/m^3. Determine the time required for drying. The falling rate may be assumed linear. **[10]**

OR

Q10) a) Discuss the theory of wet-bulb thermometry. Under what conditions the wet-bulb temperature and adiabatic saturation temperature will be identical? **[8]**

b) Discuss the significance and application of psychometric charts in simultaneous heat/mass transfer operations. **[8]**

Q11) 1200 kg (bone dry) of granular solid is to be dried under constant drying conditions from moisture content of 0.22 kg/kg of dry solid to a final moisture content of 0.025 kg/kg dry solid. The material has an effective area of 0.0655 m^2/kg. Under the same conditions the following rates were previously known. Calculate the time required for drying. **[16]**

Data :

Moisture content, X, kg/kg dry solid	Rate, N, kg/hr m^2
0.30	1.71
0.20	1.71
0.14	1.71
0.096	1.46
0.056	1.29
0.046	0.88
0.026	0.54
0.016	0.37

OR

Q12) Write short notes : **[16]**

a) Types of Cooling Towers.

b) Lews Relationship.

c) Flooding and Loading in Tray towers.

d) Types of Industrial dryers.

✷ ✷ ✷

Total No. of Questions : 12]

SEAT No.:

P1511

[Total No. of Pages : 7

[4163]-237
T.E. (Production)
TOOL DESIGN
(2008 Pattern) (Sem. - II)

Time : 4 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***From Section-I solve, Q. 1 or Q. 2, Q. 3 or Q. 4, Q. 5 or Q. 6 and from Section-II solve Q. 7 or Q. 8, Q. 9 or Q. 10, Q. 11 or Q. 12.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Use of electronic pocket calculator is allowed.***
5) ***Assume suitable data if necessary.***

SECTION - I

Q1) a) What is stopper? Explain at least two types of stoppers and which will be selected for the blanking component in fig.1 **[8]**

b) Find center of pressure for the blank in fig.1. **[8]**

OR

Q2) Design a blanking die for the blank in fig.1. (Given :- $\tau = 250 N/mm^2$)

a) Draw a best strip layout and find out material utilization, strip is cut from sheet of size 2500mm × 1250mm × 1.4mm thick. **[4]**

b) Find out cutting force and press tonnage with full share. **[4]**

c) Draw and design a die block. **[3]**

d) Draw assembly drawing i.e. front view of press tool and die plan. (plan view of press tool without assembly of upper shoe). **[5]**

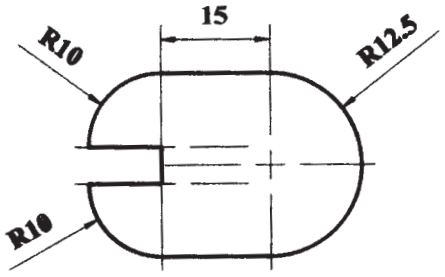


Fig. 1: Structural steel 1.4mm thick

P.T.O.

Q3) a) Find out the blank size by graphical method for drawn component shown in fig.2. And the number of draws required. **[6]**

b) What is spring back? Explain the different methods of reducing spring back and which one is used for the bend component in fig.3. **[6]**

c) Calculate the bending force required for bend the component as shown in fig.3. Given : Ultimate tensile strength of material is 360N/mm^2 and length of the bend component is 50mm. **[4]**

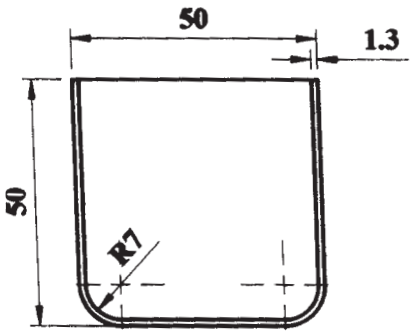


Fig. 2: Drawing component

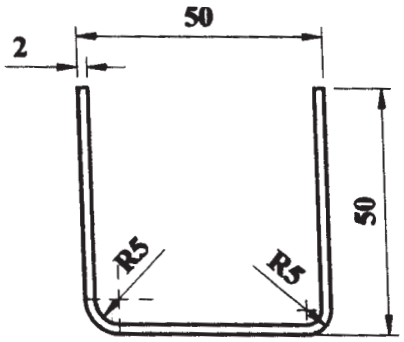


Fig. 3: Bending component

OR

Q4) a) Calculate the blank size and number of draws required for the drawn component in fig.2. **[4]**

b) Design and draw punch and die for the 1st draw. Also find out cup size after 1st draw. **[6]**

c) Calculate drawing and blanking force for 1st draw. **[2]**

d) Find out develop length for the bend component in fig.3. **[4]**

Q5) Design a progressive die for the component shown in fig.4. (Given :- $\tau = 300N/mm^2$).

a) Draw strip layout showing on it the position of feed stopper, starting stoppers and stations. **[2]**

b) Find out press tonnage by considering full shear and staggering. **[4]**

c) Draw and design a die block and find out punch and die size at each station. **[6]**

d) Draw assembly drawing i.e. front view of press tool and die plan (plan view of press tool without assembly of upper shoe). **[6]**

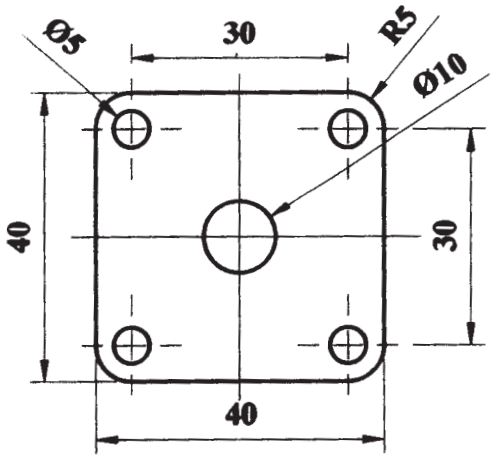


Fig. 4: Structural steel 1mm thick

OR

Q6) a) What is pilot? Explain in short types of pilot and which is used for the component in fig.3. **[6]**

b) Explain with neat sketch the general construction of die casting die. **[6]**

c) List the different types of core actuating and locking mechanism in die casting die. And explain any one with neat sketch. **[6]**

SECTION - II

Q7) Explain the rules of upsetting with designing upset die for the component as shown in fig.5. **[16]**

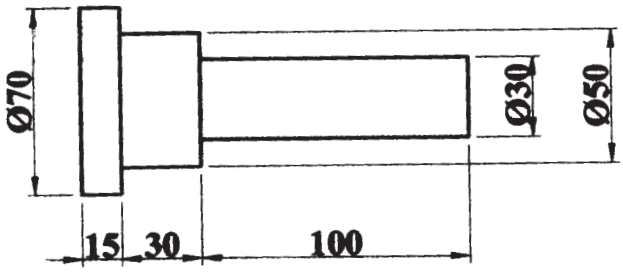


Fig. 5

OR

Q8) Design close die forging for the component shown in fig.5

a) List the forging operation required to convert the raw material into forging. **[1]**

b) Design edging impression. **[6]**

c) Calculate stock size. **[3]**

d) Design finish impression. **[6]**

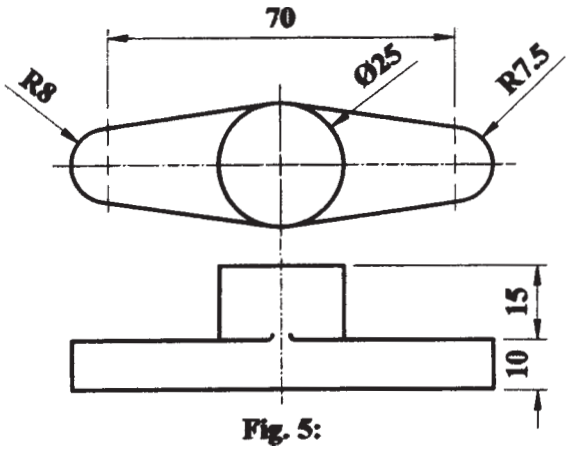


Fig. 5:

Q9) Write short note on :

a) Compression moulding. **[5]**

b) Insert cavity and core. **[6]**

c) Extrusion. **[5]**

OR

Q10) a) Explain the function of following mould parts. **[6]**

i) Guide post and guide bush.

ii) Register ring.

iii) Local insert.

iv) Core.

v) Cavity.

vi) Sprue bush.

b) Write notes on :

i) Bolster. **[5]**

ii) Ejection grid. **[5]**

Q11) Design a single impression injection mould to produce any one of the component shown in fig.7a and fig.7b. The component is to be manufacture in high impact polystyrene. The drawing should include a plan view of the moving half and side sectional view of both halves. Following point should be consider while designing. **[18]**

a) General construction.

b) Ejection system.

c) Feed system.

d) Cooling system.

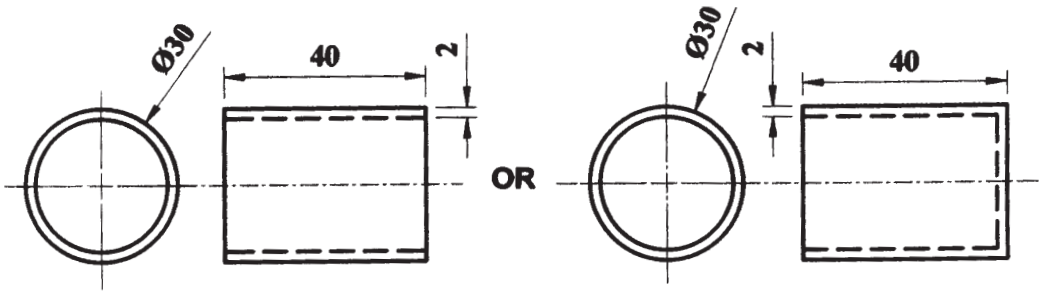


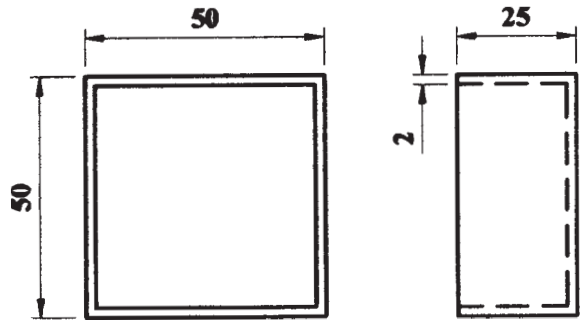
Fig. 7a **Fig. 7b**

OR

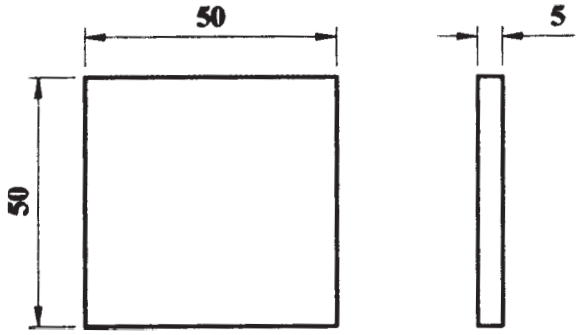
Q12) Design and draw a feed system as asked below for the following componentmade up of PVC.

Given : PVC constant (n) = 0.9 and Density (ρ) = 1.39gm/cm^3 and assume length of runner 50mm.

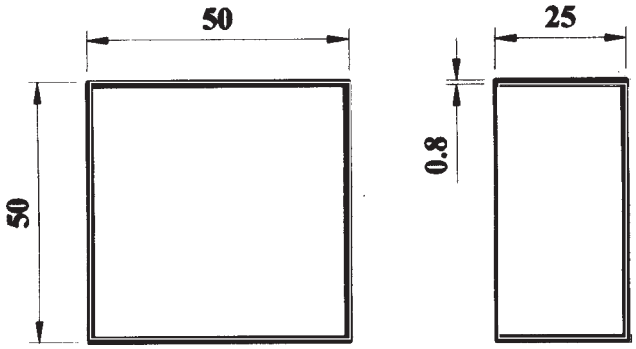
a) Runner and rectangular edge gate - **[6]**



b) Runner and overlap gate for - **[6]**



c) Runner and fan gate for - **[6]**



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Total No. of Questions : 12]

SEAT No.:

P1513

[Total No. of Pages : 7

[4163]-321

T.E. (Petrochemical Engineering)

NUMERICAL AND STATISTICAL METHODS

(2008 Pattern) (Sem. - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer Q. 1 or Q. 2, Q. 3 or Q. 4, Q. 5 or Q. 6 from section-I and Q. 7 or Q. 8, Q. 9 or Q. 10, Q. 11 or Q. 12 from section-II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of electronic pocket calculator is allowed.***
6) ***Assume suitable data if necessary.***

SECTION - I

Q1) a) Define the terms : **[6]**

i) Surplus variables.

ii) Feasible solution.

Find all basic feasible solutions to the system of equations :

$$2x_1 + x_2 - x_3 = 2$$

$$3x_1 + 2x_2 + x_3 = 3$$

b) Solve the following LPP problem using simplex method : **[10]**

Maximize $z = 4x_1 + 10x_2$

Subject to the constraints :

$$2x_1 + x_2 \leq 50$$

$$2x_1 + 5x_2 \leq 100$$

$$2x_1 + 3x_2 \leq 90$$

$$x_1,\ x_2 \geq 0$$

OR

P.T.O.

Q2) a) Write the dual of the following primal problem : **[6]**

Maximize $z = x_1 - x_2 + 3x_2$

Subject to the constraints :

$x_1 + x_2 + x_3 \leq 10$

$2x_1 - x_3 \leq 2$

$2x_1 - 2x_2 + 3x_3 \leq 6$

$x_1, x_2, x_3 \geq 0$

b) Apply the principle of duality to solve the following LPP : **[10]**

Maximize $z = 3x_1 + 4x_2$

Subject to the constraints :

$x_1 - x_2 \leq 1$

$x_1 + x_2 \geq 4$

$x_1 - 3x_2 \leq 3$

$x_1, x_2 \geq 0$

Q3) a) Solve the following transportation problem using Vogel's approximation for IBFS. **[10]**

		Shops			
		A	B	C	Availability
Factories	I	6	8	4	14
	II	4	9	8	12
	III	1	2	6	05
	Required	6	10	15	

Find optimal solution also.

b) A certain equipment needs five repair jobs which have to be assigned to five machines. The estimated time (in hours) that each machine requires is as follows. Determine the minimum time assignment. **[6]**

Machine \ Job	J_1	J_2	J_3	J_4	J_5
M_1	7	5	9	8	11
M_2	9	12	7	11	10
M_3	8	5	4	6	9
M_4	7	3	6	9	5
M_5	4	6	7	5	11

OR

Q4) a) Five men are available to do five different jobs. From past records, the time (in hours) that each man makes to do each job is known and given in the following table. Find the assignments of men to jobs that will minimize the total time taken. **[6]**

Man \ Job	I	II	III	IV	V
A	2	9	2	7	1
B	6	8	7	6	1
C	4	6	5	3	1
D	4	2	7	3	1
E	5	3	9	5	1

b) Find the optimal solution for the following transportation problem, using Vogel's approximation method. **[10]**

		Destination A	B	C	D	Availability
	1	21	16	25	13	11
Source	2	17	18	14	23	13
	3	32	27	18	41	19
	Requirement	6	13	12	15	

Q5) a) Compute correlation coefficient between supply and price of commodity using following data : **[7]**

Supply	152	158	169	182	160	166	182
Price	198	178	167	152	180	170	162

b) Probability of man aged 60 years will live for 70 years is $\frac{1}{10}$. Find the probability of 5 men selected at random 2 will live for 70 years. **[5]**

c) Number of road accidents on a highway during a month follows a poisson distribution with mean 5. Find the probability that in a certain month number of accidents on the highway will be

i) Less than 3.

ii) Between 3 and 5. **[6]**

OR

Q6) a) If the two lines of regression are $9x + y - \lambda = 0$ and $4x + y = \mu$ and the mean of x and y are 2 and – 3 respectively, find the values of λ, μ and coefficient of correlation between x and y. **[6]**

b) Assuming that the diameters of 1000 brass plugs taken consecutively from machine form a normal distribution with mean 0.7515cm and standard deviation 0.0020cm. How many of the plugs are likely to be approved if the acceptable diameter is 0.752 ± 0.004cm.

Given $z = 1.75, \quad 2.25$

area = 0.4599, 0.4878 **[6]**

c) The table below gives number of books issued from a certain library on the various days of a week. **[6]**

Days	No. of books issued
Monday	120
Tuesday	130
Wednesday	110
Thursday	110
Friday	115
Saturday	135

Test at 5% los whether issuing a book is day dependent.

Given $\chi^2_{5,\ 0.005} = 11.07$

SECTION - II

Q7) a) With usual notations prove the following : **[9]**

i) $1 - e^{-hD} = \nabla$.

ii) $(1 + \nabla)(1 - \nabla) = EE^{-1} = 1$.

iii) $\mu\delta = \frac{\Delta}{2} + \frac{DE^{-1}}{2}$.

b) A function $f(x)$ is described by the following data : **[8]**

x	1	1.1	1.2	1.4	1.6	1.9	2.2
$f(x)$	3.123	4.247	5.635	9.299	14.307	24.759	39.319

Find $\int f(x)dx$ from 1 to 2.2 using

i) Trapezoidal Rule and

ii) Simpson $\frac{1}{3}^{rd}$ rule.

OR

Q8) a) Find a polynomial passing through the values given below using Newton's interpolation formula and hence find y and $\frac{dy}{dx}$ at $x = 0.5$. **[9]**

x	0	1	2	3	4	5
y	1	1	7	25	61	121

b) Apply Stirling's formula to find y at $x = 25$ for the following data : **[8]**

x	20	24	28	32
y	2854	3162	3544	3992

Q9) a) Solve by Gauss elimination method : **[9]**

$10x - 7y + 3z + 5u = 6$

$-6x + 8y - z - 4u = 5$

$3x + y + 4z + 11u = 2$

$5x - 9y - 2z + 4u = 7$

b) Find a real root of the equation $x^3 + x^2 - 1 = 0$ using bisection method. **[8]**

OR

Q10) a) Solve : **[9]**

$54x + y + z = 110$

$2x + 15y + 6z = 72$

$-x + 6y + 27z = 85$

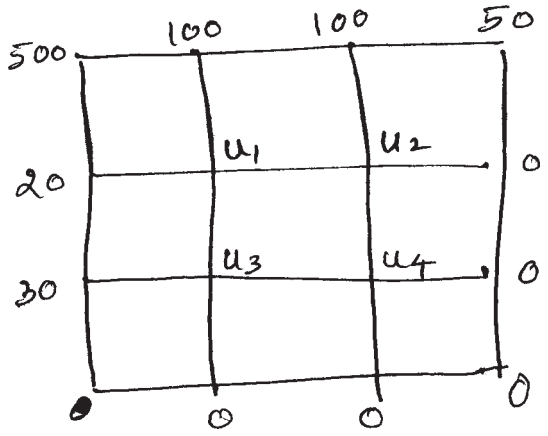
by Gauss-seidel method.

b) Fit a straight line to the following data by the method of least square. **[8]**

x :	3.4	4.3	5.4	6.7	8.7	10.6
y :	4.5	5.8	6.8	8.1	10.5	12.7

Q11) a) Determine using modified Euler's method the value of y when $x = 0.1$ given that $\frac{dy}{dx} = x^2 + y$ $\quad y(0) = 1 \quad h = 0.05$ **[8]**

b) Solve $u_{xx} + u_{yy} = 0$ in the following region with boundary conditions as shown in the figure. **[8]**



OR

Q12) a) Use Runge-Kutta method of fourth order to solve $\frac{dy}{dx}=\frac{1}{x+y}$ $x_0 = 0$ $y_0 = 1$ to find y at $x = 0.4$ taking $h = 0.2$. **[8]**

b) Solve the Poisson equation $\frac{\partial^2 u}{\partial x^2}+\frac{\partial^2 u}{\partial y^2}=-x^2y^2$ over the square region bounded by the lines $x = 0, x = 3, y = 0$ $y = 3$ given that $u = 10$ throughout the boundaries taking mesh length 1 unit. **[8]**

☒☒☒☒

Total No. of Questions : 11]

SEAT No. : ____

P1674

[Total No. of Pages : 2

[4163] - 312

T.E. (Petroleum Engineering)

PETROLEUM GEOLOGY - I

(2008 Pattern) (Sem. - I)

Time :3 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Answers to the two sections should be written in separate books.***
2) ***Neat diagrams should be drawn wherever necessary.***
3) ***Attempt any three questions from Section - I and Section - II.***
4) ***Figures to the right indicate full marks.***

SECTION - I

Q1) a) Using a sketch, explain relative abundance of igneous, sedimentary and metamorphic rocks in terms of weight and volume proportion. **[8]**

b) Distinguish between conglomerate and breccia, residual and transported soil, oligomict and polymict conglomerate, clasts supported and matrix supported conglomerate. **[8]**

OR

Q2) a) Draw flowchart to explain various processes involved in the formation of sedimentary rocks. **[8]**

b) Explain in term 'Rock Cycle' with the help of a neat diagram. **[8]**

Q3) a) How hydrolysis and solution processes are responsible for decomposition of rocks? Explain with suitable examples. **[8]**

b) Discuss with the help of neat diagrams, different types of convergent plate boundaries. **[8]**

OR

Q4) a) Describe elastic rebound theory for earthquakes with the help of neat sketches. **[8]**

b) How is mass movement classified on the basis of moisture content and velocity? **[8]**

P.T.O.

Q5) a) What is a fault? How faults are interpreted in the absence of any visible displacement? **[10]**

b) Explain flexure slip fold and shear slip fold with the help of suitable examples. **[8]**

OR

Q6) a) Describe classification of folds based on interlimb angle. How is the relationship of wavelength and amplitude useful in ascertaining the persistence and penetration of folds? **[10]**

b) Discuss in brief "Quantitative Description of Discontinuity". **[8]**

SECTION - II

Q7) a) What is a depositional sedimentary environment? Distinguish between environment of erosion, equilibrium and deposition. **[8]**

b) Draw a cross-sectional view of a sedimentary basin to show the relationship between facies, environment and time. **[8]**

OR

Q8) a) What are clay minerals? Distinguish between cohesive and in cohesive clay minerals. How are these recognized in the field? Discuss their signification in the sedimentary rocks. **[8]**

b) What are the digenetic changes taking place in sedimentary rocks with increasing depth and temperature? **[8]**

Q9) Write notes on <u>any two</u> of the following : **[16]**

a) Statistical representation of sedimentary rocks.

b) Trace fossils as an indicator of environment of deposition.

c) Use of microfossils in the exploration of hydrocarbons.

d) Dolomite and dolomitization.

e) Marine depth zones.

Q10)a) Write "Geological Time Scale" in a tabular form with important events in each era. **[10]**

b) What is a bedform? Explain in brief about generation of bedforms in relation to velocity of flow of water. **[8]**

OR

Q11)a) Explain transgression and Regression with the help of suitable diagrams. What is an onlap (Prograding) and offlap (Retrograding) sequence? **[12]**

b) Discuss in brief classification of Petroliferous basins in India as suggested by ONGC. **[6]**

Total No. of Questions : 8] **SEAT No. :**

P1680 **[Total No. of Pages : 2**

[4163] - 203

T.E. (Civil)

STRUCTURAL DESIGN - I

(2008 Pattern) (Sem. - I)

Time :4 Hours] ***[Max. Marks :100***

Instructions to the candidates:

1) ***Attempt Q. 1 or Q. 2, Q. 3 or Q. 4 from Section I and Q. 5 or Q.6 Q. 7 or Q. 8 from Section II.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figure to the right indicate full marks.***
5) ***Assume suitable data, if necessary and clearly state.***
6) ***Use of cell phone is prohibited in the examination hall.***
7) ***Use of electronic pocket calculator IS: 800 - 2007 and steel table is allowed.***

SECTION - I

Q1) a) State the advantage and disadvantage of steel as construction materials. **[10]**

b) Design a double angles tension members connected on each side of 10 mm thick gusset plate to carry an axial force of 400 kN. Also design connection using M_{20} black bolts of 4.6 Grade. **[15]**

OR

Q2) a) Explain the classification of cross section and draw the stress distribution. **[10]**

b) Determine the tensile strength of a member of roof truss 2 ISA 80 × 80 × 12 mm connected to 12 mm thick gusset plate by fillet weld.**[15]**

Q3) a) Determine the load carrying capacity of a compound column consisting of ISMB 400@ 61.6 kg/m with one cover plate of 250 mm × 20 mm on each flange and having a length of 5 m. One end of the column is fixed and other end is pinned. Assume f_y = 250 MPa. **[10]**

b) Design a built-up column 8 m long to carry a factored load of 1000 kN. The column is restrained in position but not in direction at both ends. Design the column by using two channels face to face and single lacing with bolted connection. **[15]**

P.T.O.

OR

Q4) a) A column 6 m long has to support an axial factored load of 800 kN. The column is effectively held at both ends and restrained in direction at one of the end. Design the column using I-section. **[10]**

b) Design a gusseted base for a built-up column ISMB 400@ 61.6 kg/m with two plates 450 mm × 22 mm carrying an axial factored load of 3000 kN. The column is to be supported on concrete pedestal of M 20 grade. Draw the design sketches. **[15]**

SECTION - II

Q5) a) A simply supported beam of effective span 5 m carries a factored point load of 300 kN at mid span. The compression flange is laterally supported throughout the span. Design the cross section using I - section. **[15]**

b) A beam ISMB 350 @ 52.4 kg/m transfer a factor end shear of 200 kN and a factor end moment of 50 kNm to a column ISHB 300 @ 63 kg/m. Design suitable welded connection. **[10]**

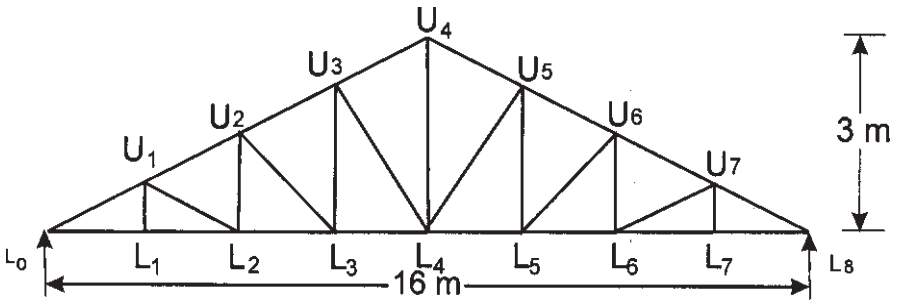
OR

Q6) Design a laterally unsupported I beam with simply supported ends of an effective span of 6 m subjected to a working load of 35 kN/m. Assume that full torsional and warping restrained are provided at the supports. **[25]**

Q7) A simply supported welded plate girder of an effective span of 24 m subjected to uniformly distributed load of 35 kN/m through out the span excluding the self weight. Assuming compression flange laterally supported throughout the span, design cross section of plate girder and stiffeners. Draw the design sketches. **[25]**

OR

Q8) Calculate panel point dead load, live load and wind load for the roof truss located in Mumbai as shown in Fig. Spacing of truss is 4 m. The coefficient of external (c_{pe}) and internal (c_{pi}) wind pressure are 0.6 and $\pm$ 0.2 respectively. Also design the member L_0L_1, L_0U_1 and U_1L_1. Assume $K_1 = K_2 = K_3 = 1$. **[25]**



Figure

Total No. of Questions : 12]

SEAT No. :

P1707

[Total No. of Pages : 7

[4163]-320

T.E. (Petroleum Engineering)

PETROLEUM EQUIPMENT DESIGN AND DRAWING

(2008 Pattern) (Sem. - II)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer three questions from each section.***
2) ***Answers to the two sections should be written in separate answre books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What is stress concentration? Define stress concentration factor. Discuss various methods to reduce stress concentration. **[8]**

b) Draw a neat sketch of flange coupling and explain its design procedure in detail with necessary formulae. **[10]**

OR

Q2) a) A transmission shaft, supporting two pulleys A and B mounted between two bearings C_1 and C_2, is shown in figure 1. Power is transmitted from pulley A to B. The shaft is made of plain carbon steel 45C8 (S_{ut} = 600 S_{yt} = 380 N/mm^2). The pulleys are keyed to the shaft. Determine the shaft diameter using ASME code if, k_b = 1.5 and k_t = 1.0 **[16]**

Also determine the shaft diameter on the basis of torsional rigidity, if permissible angle of twist between two pulleys is 0.5° and the modulus of rigidity is 79300 N/mm^2.

b) Define factor of safety. **[2]**

Q3) a) A differential band brake is shown in figure 2. The width and thickness of the still band are 100 mm and 3 mm respectively and the permissible tensile stress in the band is limited to 50 N/mm^2. The coefficient of friction between the friction lining and the brake drum is 0.25. Calculate:

i) The tension in the band
ii) The actuating force
iii) The torque capacity of the brake

Find out whether the brake is self locking? **[10]**

b) Derive an expression for length of crossed belt. **[6]**

OR

Q4) a) It is required to design a chain drive to connect a 10 kW, 1440 rpm electric motor to centrifugal pump running at 720 rpm. The service condition involves moderate shocks.

i) Select a proper roller chain and give a list of its dimensions.
ii) Determine the pitch circle diameters of driving and driven sprockets.
iii) Determine the number of chain links.
iv) Specify the correct centre distance between the axes of sprockets.

Assume number of teeth on driving sprocket as 17. **[12]**

b) Define any four : **[4]**

i) Module.
ii) Addendum.
iii) Gear Ratio.
iv) Circular Pitch.
v) Diametral Pitch.
vi) Base Circle.

Q5) a) Length of 5" × 4.276", 19.5ppf Drill Pipe is 9000 ft
Length of 6" × 3" Drill Collar is 1000 ft.
Borehole diameter = 8"
Mud Weight = 12ppg

Double acting Duplex Pump: :- liner diameter = 6"
Piston rod diameter = 2.5"
Stroke length = 16"
Pump efficiency = 85%
Pump RPM = 100

Calculate : **[12]**

i) Pumping capacity
ii) No. of Pump cycles and time required for one cycle of mud circulation.
iii) If the hole is filled up after tripping 10 stands of drill pipe from a mud tank of 8 ft width and 20 ft length what will be drop of mud level in pit.

b) Give detailed classification of compressor. **[4]**

OR

Q6) a) Write note on Mud Circulation System. **[10]**

b) A helical spring is made of a wire of 6 mm diameter and has outside diameter of 75 mm. If permissible shear stress is 350 MPa and modulus of rigidity is 84 kN/mm^2. Find axial load which the spring can carry and deflection per active turn. **[6]**

SECTION - II

Q7) a) With neat sketches explain following types of two phase separator -**[10]**

i) Horizontal.
ii) Vertical.
iii) Spherical.

b) A pressure vessel having outer diameter 1.3 m and height 3.8 m is subjected to an internal pressure of 12 kg/cm^2. If the vessel is fabricated as class B vessel joint efficiency is 85%; if the vessel is fabricated as class C vessel, with welded joint efficiency is 70% and 50%; if the vessel is provided with a strip all along the longitudinal joint, joint efficiency is 100%. Calculate the vessel thickness under these different conditions. And find out how much is the % material saving by welding a strip along the longitudinal joint.

Allowable stress of the material = 1020 kg/cm^2. Corrosion allowance is 1 mm. **[8]**

OR

Q8) a) Enlist different types of pressure vessel heads and draw neat sketches.**[6]**

b) What are the various stresses induced in a pressure vessel subjected to combined loading? How is the thickness of such pressure vessel evaluated? **[12]**

Q9) a) What are design considerations of Heat Exchanger? **[5]**

b) Write note on "Standards used for Design of shell and Tube heat exchanger". **[3]**

c) Classify Heat exchanger and explain Shell and Tube Heat Exchanger.**[8]**

OR

Q10) Design a sea water cooler to cool the total stream from the example field in its later stages of life from a following temperature of 175ºF to a temperature of 100ºF to allow further treating.

Inlet : 100 MMscfd at 0.67 SG
6000 bopd at 0.77 SG
15 bbl water/mmscf
T_1 = 175ºF
P_1 = 1000 psig
Water vapour in gas = 60 lb/mmscf

Outlet : T_1 = 100ºF
P_1 = 990 psig
Water vapour in gas = 28 lb/mmscf
Sea water T_3 = 75ºF
Limit temperature rise to 10ºF

Use 1 inch OD 10 BWG tubes on 1¼ inch pitch

Given : Gas specific heat = 0.528 Btu/lb ºF

Correction Factor (ΔCp) = 1.6
Condensate specific heat = 0535 Btu/1b ºF
Latent heat, λ = -997 Btu/lb
Correction factor for tubes, F = 0.95
Tube length, L = 40 ft.
Tube external surface area, A = 0.262 ft^2/ft.
Overall heat transfer coefficient, U = 90 Btu/hr-ft^2 - ºF
Total water flow rate in outlet = 1509 bwpd.

Calculate : **[16]**

a) Calculate total heat duty?
b) Determine sea water circulation rate.
c) Pick a type of exchanger and number of tubes required.

Q11) a) Give API guidelines for storage vessel in detail. **[6]**

b) Following data is given for fixed conical roof cylindrical tank :

Tanks diameter (inside)	= 20 m
Tank height	= 12 m
Density of liquid	= 1000 kg/m^3
Superimposed load	= 1250 N/m^2
Conical roof slope	= 1 in 5

Material of construction (MOC)	= carbon steel IS2062
Permissible stress	= 165 N/mm^2
Density of MOC	= 7850 kg/m^3
Modulus of elasticity	= 2 × 10^5 N/mm^2
Corrosion allowance	= 1.5 mm.

Design for a) shell, b) Tank Bottom. **[10]**

OR

Q12) a) In certain mixing operation a shaft of 50 mm in diameter, transmits a torque 12000 kg-cm. A square key is used whose one side is equal to ¼th of shaft diameter and whose length is equal to 1.5 times the shaft diameter. Determine the dimensions of key and check the key for its induced shearing and crushing stresses. Also determine factor of safety of key in shear and crushing when yield stress in shearing and crushing are 3500 kg/cm^2 and 4250 respectively. **[6]**

b) Write a technical essay on "Design considerations of Subsea Storage tank (Khazzan Dubai)". **[10]**

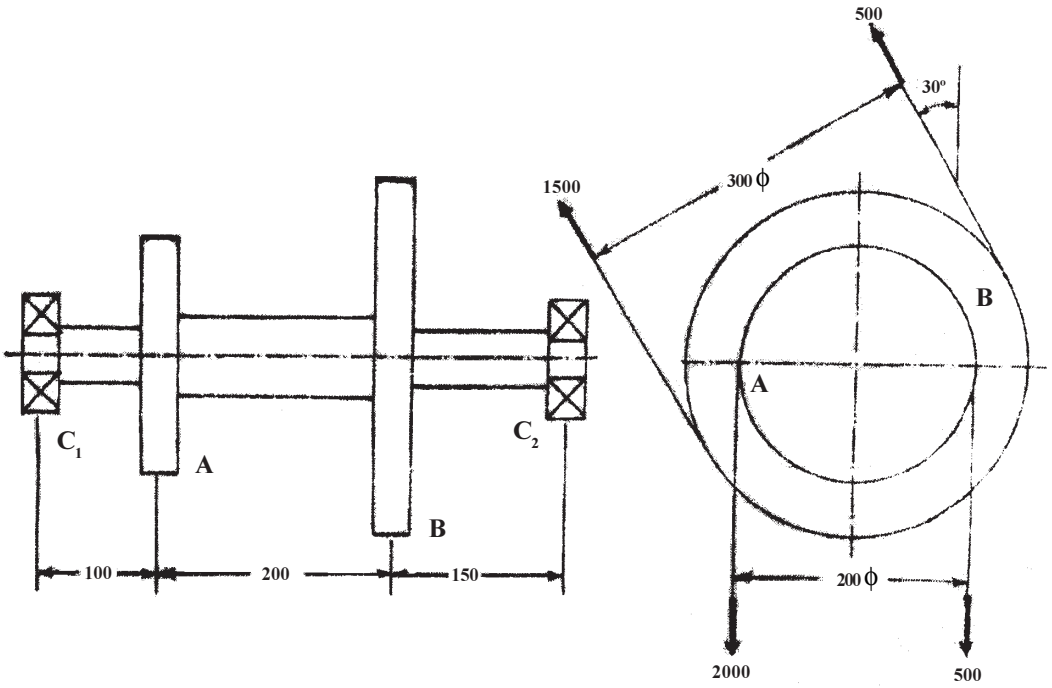


Figure 1

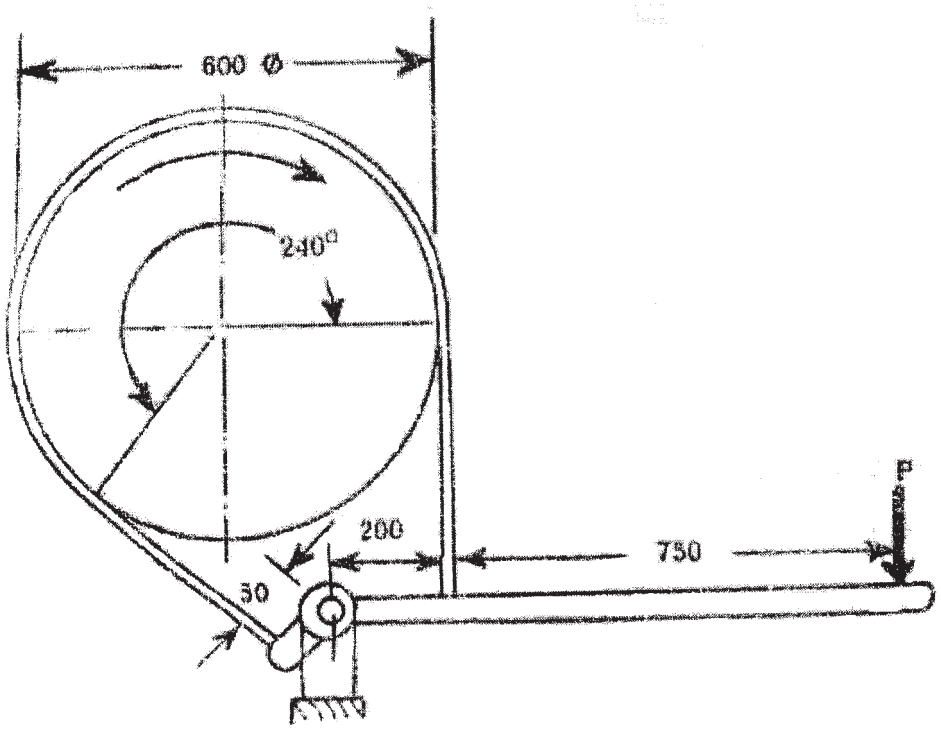


Figure 2

Dimensions and breaking loads of roller chains

ISO chain number	Pitch p (mm)	Roller diameter d_1(mm)	Width b_1 (mm)	Transverse pitch p_1 (mm)	Breaking load for single strand chain (kN)
06 B	9.525	6.35	5.72	10.24	10.7
08 B	12.70	8.51	7.75	13.92	18.2
10 B	15.875	10.16	9.65	16.59	22.7
12 B	19.05	12.07	11.68	19.46	29.5
16 B	25.40	15.88	17.02	31.88	65.0
20 B	31.75	19.05	19.56	36.45	98.1
24 B	38.10	25.40	25.40	48.36	108.9
28 B	44.45	27.94	30.99	59.56	131.5
32 B	50.80	29.21	30.99	58.55	172.4
40 B	63.50	39.37	38.10	72.29	272.2

Table 1

Power rating for simple roller chain

Pinion speed (r.p.m.)	Power (kW)				
	06 B	08 B	10 B	12 B	16 B
50	0.14	0.34	0.64	1.07	2.59
100	0.25	0.64	1.18	2.01	4.83
200	0.47	1.18	2.19	3.75	8.94
300	0.61	1.70	3.15	5.43	13.06
500	1.09	2.72	5.01	8.53	20.57
700	1.48	3.66	6.71	11.63	27.73
1000	2.03	5.09	8.97	15.65	34.89
1400	2.73	6.81	11.67	18.15	38.47
1800	3.44	8.10	13.03	19.85	––
2000	3.80	8.67	13.49	20.57	––

Table 2

Service factor (Ks)

	Type of input power	Type of driven load		
		Smooth	Moderate shock	Heavy shock
i)	I.C. Engine with hydraulic drive	1.0	1.2	1.4
ii)	Electric motor	1.0	1.3	1.5
iii)	I.C. Engine with mechanical drive	1.2	1.4	1.7

Table 3

✷ ✷ ✷

Total No. of Questions : 12]

SEAT No.:

P1708

[Total No. of Pages : 3

[4163]-339
T.E. (Polymer Engineering)
POLYMER PROCESSING OPERATIONS - I
(2008 Pattern) (Sem. - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer Q. No. 1 or 2, Q. No. 3 or 4 and Q. No. 5 or 6 from section-I. Answer Q. No. 7 or 8, Q. No. 9 or 10 and Q. No. 11 or 12 from section-II.***
2) ***Answers to the two sections must be written in separate answer books.***
3) ***Figures to the right indicate full marks.***
4) ***Use of pocket calculator, graph paper is allowed.***
5) ***Assume suitable design data, if required.***

SECTION - I

Q1) a) Draw development view of barrier section. Explain how melt and solid separation takes place. Give merits and demerits of barrier type single screw. **[7]**

b) Analyse flow through hopper. Discuss various feed throat designs. **[7]**

c) Explain in short why worn out screws give less output. **[4]**

Q2) a) Explain screw and die characteristics. Obtain an expression for pressure at operating point considering a capillary die. **[7]**

b) Write expressions for pressure flow, drug flow and leakage flow in case of output of single screw extrusion. **[5]**

c) Explain what do you understand by autogeneous speed in case of extrusion. **[6]**

Q3) a) Explain in short effect of following V-P switchover situations on quality of moulding. **[8]**

i) No V-P switchover.
ii) Too late V-P switchover.
iii) Too early V-P switchover.
iv) Correct V-P switchover.

b) Draw a bar chart showing various operations of injection moulding cycle. Write in short about each operation. **[8]**

P.T.O.

Q4) a) Write in short about following injection moulding machine specifications.

i) Injection unit size.
ii) Screw torque and screw rpm.
iii) Minimum and maximum daylight.
iv) Injection rate and injection power. **[8]**

b) Write in short about following process problems (any two) : **[8]**

i) silver streaks.
ii) burn marks.
iii) short mouldings.

Q5) a) Draw a neat sketch of monolayer blown film plant layout. Explain the need for each constituent in the layout. **[8]**

b) With reference to blown film, define **[4]**

i) blow ratio.
ii) draw down ratio.

c) With schematic sketch, discuss typical water cooling tank design requirement as used in different extrusion lines. **[4]**

Q6) a) Explain different constituent elements in wire or strand covering extrusion line. Discuss in brief. **[6]**

b) Discuss typical coating processes like wire coating, dip coating, knite coating, roll coating etc in short. **[6]**

c) Discuss at least two typical cooling and forming fixtures for profile extrusion. **[4]**

SECTION - II

Q7) a) What is the use of stuffing box in injection moulding of DML? **[4]**

b) Explain various points on which injection moulding machine for thermosets differs from that of thermoplastics. **[7]**

c) Write in short about process, application and merits of reaction injection moulding. **[7]**

Q8) a) Explain how merits of conventional injection moulding and compression moulding are combined in injection-compression moulding. **[7]**

b) With schematic sketches, explain any one type of two material/two component injection moulding process. **[7]**

c) Suggest a suitable manufacturing process for manufacturing hand gloves. Discuss entire set up. **[4]**

Q9) a) Draw schematic sketch of in line rod shaper device and explain the functioning. **[4]**

b) Draw a schematic sketch of any one type of straight through pipe die and explain functioning of each part in one line. **[6]**

c) Draw a skematic sketch of external calibrator wih floating plug on chain. Explain application. **[6]**

Q10) a) Explain various methods of producing orientation in extruded products. Draw line diagram, if required. Discuss the effects of orientation on product. **[8]**

b) With neat sketches, explain any one method to make sandwich panels by extrusion. **[8]**

Q11) a) House hold dinner-ware plates are to be made by compression moulding suggest material and type of compression mould that can be used. **[5]**

b) Draw a neat-sketch of compression mould and discuss design features. **[6]**

c) Discuss infra-red pre-heating of thermosetting material, prior to compression or transfer moulding. **[5]**

Q12) a) How will you use flow-cure relationship curve for process control in case of compression and transfer moulding? **[8]**

b) Discuss various constituents of thermosetting material formation for compression and transfer moulding. **[6]**

c) Define bulk factor of material. **[2]**

Total No. of Questions : 12]

SEAT No. :

P1709

[Total No. of Pages : 4

[4163]-340
T.E. (Polymer)
POLYMER RHEOLOGY
(2008 Pattern) (Sem. - II)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer question number 1 or 2, 3 or 4, 5 or 6 from Section I. Answer question number 7 or 8, 9 or 10 and 11 or 12 from Section II.***
2) ***Answers to the two sections must be written in separate answer books.***
3) ***Figures to the right indicate full marks.***
4) ***Draw neat sketches wherever required.***
5) ***Use of calculator, graph paper is allowed.***

SECTION - I

Q1) a) Giving a step input in strain $\gamma = \gamma_0$ at time $t = t_0$, show the variation of stress with time for purely elastic, purely viscous and viscoelastic material. **[6]**

b) Give the definitions for the following terms. **[5]**

i) Kinematic viscosity.
ii) Creep compliance.
iii) Non-newtonian fluids.
iv) Tensile viscosity.
v) Pseudoplastic fluid.

c) Explain effect of normal stress difference with 2 examples. **[5]**

OR

Q2) a) Explain creep and stress relaxation plots for viscoelastic materials. **[6]**

b) Give definitions for the following terms : **[6]**

i) dynamic viscosity
ii) modulus storage
iii) Newtonian fluids
iv) shear viscosity
v) Bingham fluid.

c) Explain melt fracture effect giving suitable reasons and remedy for the same. **[4]**

P.T.O.

Q3) a) Explain Boltzman superposition principle with an example. **[8]**

b) What is the significance of WLF equation. Explain with an example. **[5]**

c) What are isochronous stress-strain curves used for? Explain with an example. **[5]**

OR

Q4) a) Using any one mechanical model, describe the viscoelastic behavior taking stress relaxation and creep into consideration. **[8]**

b) Explain Doi-Edward's theory. **[5]**

c) A test piece having dimensions 3 × 6 × 20 mm is subjected to a tensile force of 150N. Force was later removed to give instantaneous recovery. Calculate

i) Instantaneous compliance

ii) Compliance at t = 200 secs using following data. **[5]**

Time (secs)	0	10	50	150	200
Length (mm)	50	75	100	120	135

Q5) a) Explain the effect of temperature on viscosity. Also explain the concept of activation energy. **[6]**

b) Explain the effect of fillers on viscosity with proper reason. **[6]**

c) Give the effect of copolymerization on viscosity with examples. **[4]**

OR

Q6) a) Give effect of molecular weight and molecular weight distribution on viscosity. Explain its role in injection molding and extrusion. **[6]**

b) Explain the effect of shear rate on viscosity. **[4]**

c) Explain the effect of crosslinking on viscosity. **[6]**

SECTION - II

Q7) a) Derive an expression for swelling ratio due to shear stresses in a long capillary. **[5]**

b) Calculate the pressure drop through a capillary with diameter 10 mm and length 50 mm. The mass flow rate is 25 g/s, melt density is 0.76g/cm^3.

The fluid obey's the power law $\tau = 1,60,000\,\dot{\gamma}^{0.35}$. **[5]**

c) Explain biaxial and planar extensional flow during polymer processing giving suitable examples. **[6]**

OR

Q8) a) Derive an expression for velocity profile and shear rate at wall for a Newtonian fluid through a capillary. **[6]**

b) Derive an expression for pressure drop due to shear in a wedge shaped die. **[6]**

c) For a polymer melt obeying the power $\tau = 1{,}40{,}000\ \dot{\gamma}^{0.33}$, calculate

i) $\lambda = r / r_0$ at which Ryan Johnson stability parameter will be maximum.

ii) Critical Reynold's number for transition between laminar and turbulent flow. **[4]**

Q9) a) Write a note on various geometries used to study extensional flow behavior. **[6]**

b) Write a note on oscillatory shear experiments used to study viscoelastic nature of polymer melts. **[6]**

c) For a cone & plate rheometer with plate diameter = 10 cm and cone angle of 1.5°, following torque-angular velocity data was generated. Determine *k* and *n* if it obeys power law. Use analytical method to obtain the solution. **[6]**

Ω (rpm)	5	25	55	85	175	355	550
T (N-m)	10	15	20	25	30	35	40

OR

Q10) a) Write down the classification of rheometers. **[4]**

b) Calculate the Bagley's correction for the following pressure drop - volumetric flow rate data for a polymer extruded through a 2 mm capillary at a flow rate of 300×10^{-9} m^3/s. **[8]**

L/D ratio of capillaries	20	10	5	1
ΔP (MPa)	60	40	25	15

c) Sketch the various geometries used to generate shear flow due to drag and pressure. **[6]**

Q11) a) Derive an expression for time taken by a power law fluid to fill a centre gated circular disc cavity with radius *r* and depth H for isothermal conditions during injection molding. **[10]**

b) A circular plate with a diameter of 0.5 m is compression molded. If the perform is cylindrical with 500 mm diameter and depth of 36 mm, estimate platen force needed to produce the plate in 12 seconds. The viscosity of the material can be taken as 10^3N S/m^2. **[6]**

OR

Q12) a) For a polymer obeying power law $\tau = 1,40,000\ \dot{\gamma}^{0.38}$, estimate pressure drop through a square channel of length 60 mm if one side of the square is 10 mm. Compare this with pressure drop through a semicircular profile of diameter 10 mm and the same length. **[10]**

b) Write down relevant formula to find pressure drop through a circular runner of radius *r*, length *l* if volumetric flow rate is Q_1. Also, write down the formula to find pressure drop through a rectangular gate of depth *d*, width *w* and length *l* if pressure drop is Q_2. **[6]**

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Total No. of Questions : 10]

SEAT No.:

P1792

[Total No. of Pages : 2

[4163]-316
T.E. (Petroleum)
PETROLEUM GEOLOGY - II
(2008 Pattern) (Sem. - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answers to the questions of both the sections should be written in separate answer books.***
2) ***Draw neat diagrams wherever necessary.***

SECTION - I

Q1) Explain important physical and chemical properties of crude oil. **[15]**

OR

Q2) a) With the help of neat diagrams give important types of surface and subsurface occurrences of petroleum. **[10]**

b) Explain one chemical and one genetic classification of oil field water. **[5]**

Q3) What is kerogen? Explain types of kerogen? How does type of kerogen affect final product? **[15]**

OR

Q4) What is the need to assume that migration of hydrocarbons takes place from the source rocks? Give evidences of short distance and long distance migration. **[15]**

Q5) Answer any two of the following : **[20]**

a) Explain geological conditions giving rise to sealing mechanism in sand shale sequence.

b) Give a classification of 'traps'. Describe various types of structural traps with the help of neat sketches.

c) Source rock evaluation.

d) Unconventional natural hydrocarbon sources.

P.T.O.

SECTION - II

Q6) Explain in brief, important marine environments of deposition of carbonates with sketches. **[15]**

OR

Q7) Write notes on any three of the following : **[15]**

a) Cross sectional view of a sedimentary basin.

b) Types of carbonate porosity.

c) Maturation of hydrocarbons in reservoir rocks.

d) Sedimentary Facies analysis.

e) Heat flow in sedimentary basins.

Q8) Describe geology and hydrocarbon potential of any one of the hydrocarbon producing basins of India. **[15]**

a) Mumbai offshore basin.

b) Cambay basin.

c) Krishna Godavari basin.

OR

Q9) a) Write in brief about classification of Petroliferous Basins of India. **[5]**

b) Explain distribution of petroleum in time and space. **[10]**

Q10) Answer any four of following : **[20]**

a) Draw generally accepted symbols to show different types of sedimentary rocks and types of wells.

b) How is gas analysis carried out at the drill site? Which gases are generally locked for?

c) Explain different types of subsurface maps.

d) Give importance of Geo-Technical Order (Well Plan) and give its contents in general.

e) What are the present hydrocarbon resource estimates of India?

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Total No. of Questions : 8]

SEAT No. :

P1795

[Total No. of Pages : 3

[4163]-319
T.E. (Petroleum Engineering)
NATURAL GAS ENGINEERING
(2008 Pattern) (Sem. - II)

Time :3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answers to the two sections should be written in separate answer books.***
2) ***Figures to the right indicate full marks.***
3) ***Neat diagrams should be drawn wherever necessary.***
4) ***Use a non programmable calculator.***
5) ***Assume suitable data if necessary and clearly state it.***

SECTION - I

Q1) a) Draw the graph of viscosity, Bg, Cg and Z factor versus pressure and explain. **[8]**

b) Find viscosity, molecular weight, specific gravity, pseudocritical properties, Z factor, Bg. Gas data: Pci, Tci are : 668, 708, 493 psia; 343, 520, 227R. ωi and μi are 0.01, 0.09, 0.04 and 0.001, 0.002, 0.0015cp respectively. Explain the chart you use to correct for water and CO_2?**[8]**

Q2) a) Why is gas flow in porous media different from liquid flow? **[8]**

b) What is the inflow performance curve for gas reservoir? What is an out flow performance curve? What is a tubing intake curve? Plot all on same graph? What is the usefulness of this graph? Explain in detail. **[8]**

Q3) What is the maximum pressure at which a 10 inch normal pipe size (OD = 10.75, ID = 10.02) can be operated?

Calculate the maximum through put for a 40 mile pipe line of this type. Assume e/d = 0.002, c = 0.05, E = 1.0, Y = 0.4, S = 35.000psi, Tav = 100 F, viscosity = 0.01, Z = 0.74, specific gravity = 0.7, thickness =0.73 in. Assume 0.0psia minimum pressure. **[16]**

P.T.O.

Q4) a) Phase diagrams for Gas Reservoir

b) IPR equations for gas wells

c) Gas processing facilities.

[18]

SECTION - II

Q5) Draw the process diagram for glycol dehydration and explain the design considerations? **[16]**

Q6) a) Derive the equation for gas flow in a pipeline. **[8]**

b) Calculate the flow capacity of the pipeline using the three approximations of single phase gas flow in a horizontal pipeline, if the following data is given **[8]**

i) P1 = 550 psi
ii) P2 = 250 psi
iii) T = 95 deg F
iv) L = 100 miles
v) D = 10 inches
vi) Specific gravity of gas = 0.65.

Q7) a) Draw a diagram and write a note on reciprocating compressors and explain. **[8]**

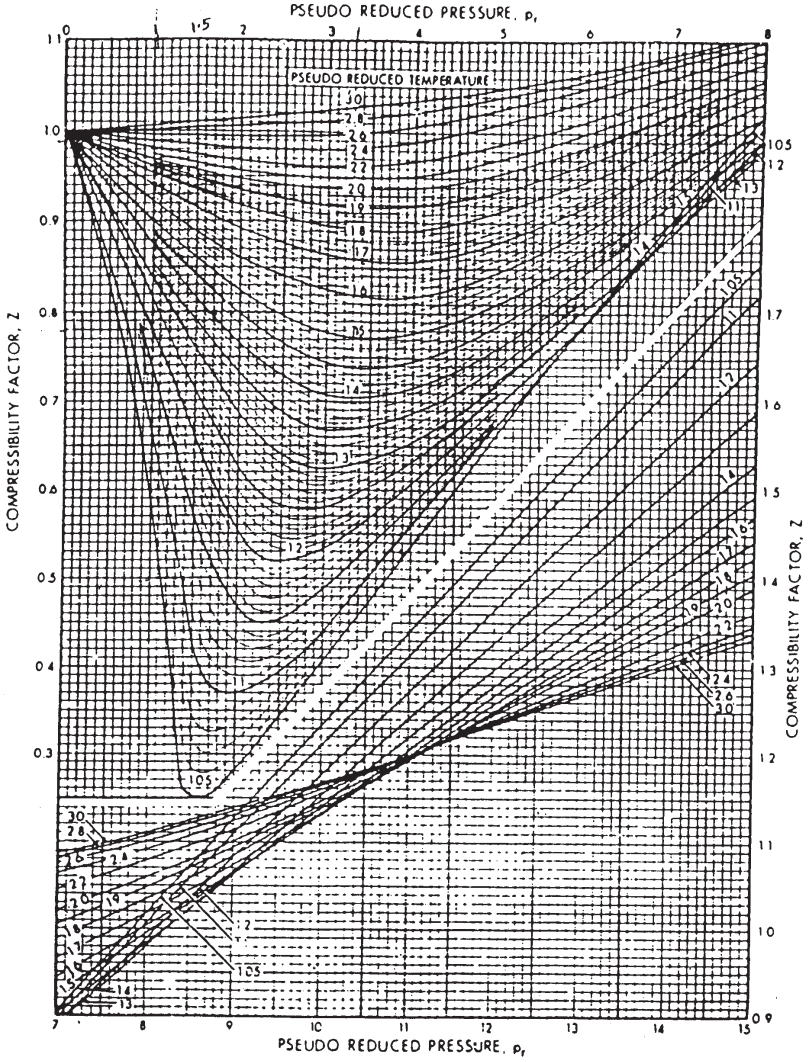
b) What is the HP required in compressing 1 MMSCFD from 100 psia and 80 F to 1600 psia using adiabatic equation? The gas is cooled to 80 F between stages. What is the discharge temperature of the gas? k = 1.28, gas gravity = 0.6, Z at 400 and 1600 psia are 0.985, 0.94 respectively.**[8]**

Q8) Short notes on : **[18]**

a) Gas metering systems.

b) Steady state and non steady state flow in pipelines.

c) Gas hydrates.


PSEUDO REDUCED PRESSURE, p_r
PSEUDO REDUCED TEMPERATURE
COMPRESSIBILITY FACTOR, Z
PSEUDO REDUCED PRESSURE, p_r
COMPRESSIBILITY FACTOR, Z

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Total No. of Questions : 8]

SEAT No.:

P1796

[Total No. of Pages : 2

[4163]-328
T.E. (Petrochemical)
REACTION ENGINEERING - I
(2008 Pattern) (Sem. - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Attempt any three questions from each section.***
2) ***Answer to the two sections should be written in two separate answer books.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data wherever necessary.***
5) ***Use of steam tables and electronic calculator is allowed.***

SECTION - I

Q1) The following table reports the kinetic data obtained in a batch reactor for a second order liquid phase reaction A $\rightarrow$ products under isothermal conditions at 100C. Initial concentration of A was 5.0M.

Time, min	5	10	15	20	25	30	35	40
Conc., mol/L	4.44	4.00	3.64	3.33	3.08	2.86	2.67	2.50

In another run carried out using the same initial concentration of A but temperature of 200C, concentration of A dropped to 2.5 mol/L in 25 min. Calculate second order rate constants at 100C and 200C. Calculate frequency factor and activation energy for the reaction. **[16]**

Q2) Second order liquid phase reaction A $\rightarrow$ 2.5 R is carried out in a 1500 Lit tubular reactor which is fully occupied by the reaction mixture. Laboratory studies in a batch reactor report 70% conversion in five minutes when reaction was started with 2.5 Mol/L concentration of A. What will be the kg/hr weight produced of R if space time in 1000L reactor is 1.5 minutes and if the reactor inlet concentration of A is 4.5 Mol/L? (Mol Wt of R is 150). How will your answer change if the reactor type is changed to CSTR? **[18]**

Q3) Liquid phase reaction A $\rightarrow$ R follows the following kinetics : **[16]**

$-r_A = 1.2C_A^{1.5}$ mol/lit.hr. This reaction is to be carried out in a series of two CSTRs. Feed stream to the first reactor has concentration of A as 3.5 mol/L which is to be reduced to 0.5 mol/L in the exit of the second reactor. Using graphical procedure, find the optimum residence times required to be spent in two CSTRs.

P.T.O.

Q4) a) A mixed flow reactor (5 cubic meter) processes an aqueous feed containing reactant A (Concentration 100 mmol/liter). The reaction is reversible with forward rate constant and equilibrium constant as 0.19 per min and 0.85 per min respectively. If the conversion is to be 95% of the equilibrium conversion, what should be the permissible volumetric flow rate of the feed? **[8]**

b) Discuss in detail how reactors of different types can be arranged for maximum conversion depending upon the kinetics of the reaction. **[8]**

SECTION - II

Q5) For the irreversible gas phase reaction A $\rightarrow$ 2B the following kinetics was reported based on laboratory data when initial concentration is 0.2 gmol/L :

For $x \leq 0.5$, $\dfrac{10^{-8}}{-r_A} = 3.0 \text{m}^3 \text{ . s/mol}$

For $x > 0.5$, $\dfrac{10^{-8}}{-r_A} = 3.0 + 10\,(x - 0.5) \text{m}^3 \text{ . s/mol}$

Where, x = fractional conversion of A.

For volumetric flow rate of 5.0 $\dfrac{m^3}{s}$, calculate plug flow reactor volume necessary to achieve 70% conversion. **[18]**

Q6) Consecutive first order reactions A $\rightarrow$ R $\rightarrow$ S are to be carried out in CSTR. Derive expression for optimum space time so that production of R is maximized. **[16]**

Q7) A first order liquid phase reaction is to take place in an adiabatically operated PFR. The reaction is exothermic with maximum possible temperature rise of 150C over the feed temperature. Feed temperature is 80C. Rate constant of the reaction is given as $k = 0.5e^{-8000/T}$ s $^{-1}$. Calculate volume of the PFR required for a feed rate of 1000m^3/hr for the desired conversion level of 80%. **[16]**

Q8) Write in detail about : **[16]**

a) Multiple steady states in adiabatic CSTR and

b) Governing equations of ideal reactors from general mol balance equation.