

T.E. (E & TC/Electronics, Indl. Elex.) Semester – II Examination, 2011
POWER ELECTRONICS
(2003 Course)

Time : 3 Hours

Max. Marks : 100

- Instructions :** i) Solve Q. 1 or Q. 2, Q. 3 or Q. 4 and Q. 5 or Q. 6 from Section – I. Solve Q. 7 or Q. 8, Q. 9 or Q. 10 and Q. 11 or Q. 12 from Section – II.
- ii) Answers to the **two** Sections should be written in **separate** books.
- iii) **Neat** diagrams must be drawn **wherever** necessary.
- iv) **Black** figures to the **right** indicate **full** marks.
- v) **Use** of logarithmic tables and non programmable electronic pocket **calculator** is **allowed**.
- vi) Assume **suitable** data, **if** necessary.

SECTION – I

1. a) Explain the operating principle of SCR using two transistor analogy. **8**
 b) Draw and explain the driver circuit for IGBT. **8**

OR

2. a) Explain the turn off mechanism of GTO. **8**
 b) What are the advantages of IGBT over power MOSFET and power BJT ? **4**
 c) Draw and explain reverse recovery characteristics of power diode. **4**
3. a) With the help of a neat circuit diagram and relevant waveforms, explain the two quadrant operation of single phase fully controlled bridge converter. Derive the expression for average output voltage. **12**
 b) Define input supply power factor. Compare the input supply power factor of semi converter and full converter. **4**

OR

4. a) With the help of a neat circuit diagram and relevant waveforms, explain the operation of three phase half controlled bridge converter. **12**
 b) Derive the expression for average output voltage of three phase fully controlled bridge converter. **4**

P.T.O.



5. a) With the help of a neat circuit diagram and relevant waveforms, explain the operation of three phase inverter operating with 180 degree conduction mode. **12**
- b) What do you understand by PWM ? Explain its advantages. **6**

OR

6. a) Explain the operation of single phase square wave inverter with circuit diagram and relevant waveforms. **10**
- b) Explain cross conduction or shoot through fault in inverter. How will you overcome it ? Draw circuit diagram and necessary waveforms. **8**

SECTION – II

7. a) Write a short note on step up chopper. **6**
- b) What are resonant converters ? Explain the necessity of resonant converters. What are their advantages ? **4**
- c) With the help of circuit diagram and waveforms explain the operation of SLR half bridge DC/DC converter in low frequency (discontinuous conduction) mode. **8**

OR

8. a) State and explain various control strategies used in dc-dc converters. **6**
- b) A step down DC chopper has a resistive load of $R=15\Omega$ and input voltage $V_s=200V$. When the chopper is on, its voltage drop is 2.5V. The chopper frequency is 1 KHz.
If the duty cycle is 50%, determine
- i) Average output voltage
 - ii) rms output voltage
 - iii) Chopper efficiency **6**
- c) With the help of a neat circuit diagram and waveforms, explain the operation of two quadrant type C chopper. Mention its application. **6**



9. a) Explain the operation of a single phase AC controller operating with integral cycle control. **8**
- b) With the help of a circuit diagram, explain the use of TCA 785 for the control of single phase AC controller. **8**

OR

10. a) Draw the circuit diagram of 3 phase full wave AC controller. Explain its operation with the help of relevant waveforms. The load is star connected balanced resistive load. **10**
- b) Compare back to back connected SCR module and triac with reference to AC controller. **6**
11. a) Write short note on High frequency induction heating. **8**
- b) Explain various speed control techniques of a separately excited DC motor. Compare them. **8**

OR

12. a) Explain the advantages of HVDC transmission over HVAC transmission. Also explain the 12 pulse converter used in HVDC transmission. **10**
- b) Write a short note on UPS. **6**



T.E. (E & TC/Electronics, Indl. Elex.) Semester – II Examination, 2011
ADVANCED MICROPROCESSORS
(2003 Course)

Time : 3 Hours

Max. Marks : 100

- Instructions* : 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

1. a) Explain following addressing modes of 8086 with suitable examples. **8**
- i) Register Relative ii) Indexed
- iii) Based indexed iv) Relative based indexed
- b) Describe interrupt structure of 8086. **4**
- c) Write a program in assembly language of 8086 to reverse the string accepted from user. **4**

OR

2. a) Explain string related instructions in 8086. **6**
- b) Explain segmentation with reference to 8086 and its advantages. **6**
- c) Write a program in assembly language of 8086 to check whether the string accepted from user is palindrome or not. **4**
3. a) Explain register model of 80386. **8**
- b) Explain different mechanisms of changing privilege levels of 80386. **6**
- c) State important features of VM86 mode in 80386. **4**

OR



- 4. a) Describe TSS and its role in multitasking. **6**
- b) With reference to 80386 explain important features of following modes : **8**
 - i) Real Mode
 - ii) Protected Mode
- c) Draw and explain flag register of 80386. **4**
- 5. a) Explain with suitable diagram memory organization in personal computer. **8**
- b) Explain various data encoding formats used for storing data on magnetic disk. **6**
- c) Write pins of PS/2 mouse. **2**

OR

- 6. a) With suitable diagram explain interfacing of Keyboard to PC. **6**
- b) Explain with block diagram functioning of typical Pentium Motherboard. **6**
- c) Write two features of following video Adaptors **4**
 - i) VGA
 - ii) CGA

SECTION – II

- 7. a) State advantages of USB over conventional serial bus. **4**
- b) With respect to USB explain **8**
 - i) Endpoint
 - ii) Enumeration
 - iii) Different types of data transfer
- c) List specifications of ISA bus. **4**

OR

- 8. a) Describe different signals associated with parallel port while interfacing 8 bit ADC to PC **6**
- b) State important specifications of PCI bus. **4**
- c) Write a program in assembly language or in C to implement serial communication between two PCs. **6**



- 9. a) What is device driver ? Explain structure of MS-DOS device driver. **8**
- b) What is preemptive and Non preemptive scheduling ? Explain and differentiate between them. **8**

OR

- 10. a) What is Inter process communication [IPC] ? What are different ways to achieve mutual exclusion during IPC ? Explain any two of them. **8**
- b) With respect to file system explain **4**
 - i) File Attribute **4**
 - ii) File Structure **4**
- c) What is TSR and what is its utility ? **4**
- 11. a) Differentiate between RISC and CISC architecture. **6**
- b) Explain data flow model of ARM core. **8**
- c) What is AMBA ? Explain. **4**

OR

- 12. a) Explain following modes of operation with reference ARM architecture. **6**
 - i) Supervisory Mode **4**
 - ii) IRQ Mode **4**
- b) Draw and explain CPSR register. **4**
- c) Explain following ARM instructions : **8**
 - i) LDR R0, [R1], # 4
 - ii) BL Next
 - iii) MOV R2, R #, LSL # 2
 - iv) Add R1, R2, R3.



**T.E. (Mechanical S/W) (Semester – II) Examination, 2011
THEORY OF MACHINES AND MACHINES DESIGN – II
(2003 Course)**

Time : 4 Hours

Total Marks : 100

- Instructions :* 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**.

SECTION – I

1. a) Explain function generation, path generation and body guidance. **6**
- b) A four bar mechanism is to be designed, using three precision points, to generate the function $y = x^{1.5}$, for the range $1 \leq x \leq 4$.
Assuming 30° starting position and 120° finishing position for the input link and 90° starting position and 180° finishing position for the output link, find the values of x , y , θ and ϕ corresponding to the three precision points. **10**

OR

2. a) Derive an expression for displacement, velocity and acceleration of a follower having simple harmonic motion. **6**
- b) The following data relate to a cam operating an oscillating roller follower :
- Minimum radius of cam = 30 mm
Radius of roller = 15 mm
Length of follower arm = 45 mm
Distance of fulcrum centre from cam centre = 60 mm



Angle of ascent = 80°

Angle of descent = 110°

Angle of dwell between ascent and descent = 60°

Angle of oscillation of follower = 30°

Draw the profile of the cam if the follower moves outward with uniform acceleration and retardation and returns with uniform velocity. **10**

3. a) Derive the equation for maximum efficiency of spiral gears with a neat sketch. **8**
- b) Two gears having 30 and 40 involute teeth respectively are in mesh. The pressure angle is equal to 20° , module is 12 mm. Line of contact on each side of the pitch point is two third of maximum possible length. Find the height of addendum for each wheel, total length of path of contact and the contact ratio. **8**

OR

4. a) Write a short note on interference and undercutting. **6**
- b) The following data refers to a spiral gear drive :
- Approximate centre distance = 380 mm
- Speed ratio = 2
- Shaft angle = 50°
- Normal pitch = 18 mm
- If the spiral angles of the driving and driven wheels are equal, find :
- The number of teeth on each wheel
 - The exact centre distance
 - The efficiency of drive if friction angle is 6° . **10**



5. a) Explain self locking brake and self energizing brake. **4**
- b) A cone clutch with a semi-cone angle of 15° transmits 10 kW at 600 r.p.m. The normal pressure intensity between the surfaces in contact is not to exceed 100 kN/m^2 . The width of the friction surfaces is half of the mean diameter. Assume coefficient of friction as 0.25. Determine :
- i) The outer and inner diameters of the plate
 - ii) Width of cone face
 - iii) The axial force to engage the clutch. **14**

OR

6. a) Explain construction and working of a centrifugal clutch with neat sketch. **6**
- b) A band and block brake is lined with 12 equal blocks each subtending an angle of 15° at the centre of the brake drum of 480 mm diameter. The radial thickness of the blocks is 60 mm. The coefficient of friction between the block and the drum is 0.40 and the two ends of the band are attached to the pins on opposite sides of the fulcrum of the brake lever at 200 mm and 50 mm. Find the least force to be applied at the end of brake lever at a distance of 400 mm from fulcrum to absorb 200 kW at 25 rad/s. **12**

SECTION – II

7. a) A spur pinion having 21 teeth to be made of plain carbon steel 55C8 ($S_{ut} = 720 \text{ N/mm}^2$) is to mesh with a gear to be made of plain carbon steel 40C8 ($S_{ut} = 580 \text{ N/mm}^2$). The gear pair is required to transmit 22 kW power from an I.C. Engine running at 1000 RPM to a machine running at 300 RPM. The starting torque required is 200% of the rated torque, while the load distribution factor is 1.5. The factor of safety required is 1.5. The face width is ten times the module and the tooth system is 20° full depth involute. The gears are to be machined to meet the specifications of grade 6. The gear and pinion are to be case hardened to 400 BHN and 450 BHN respectively. The deformation factor for gear pair is $11500e$, N/mm. Design the gear pair by using the dynamic load factor, $K_v = \frac{6}{6 + v}$ and Buckingham equation for dynamic load. For grade 6, take $e = 8.0 + 0.63 \left[m + 0.25\sqrt{d} \right]$ mm. **12**



- b) Prove that equal strength nested springs having the same solid length and deflection would have the spring index. 4

OR

8. a) A composite compression spring has two closed coil helical springs. The outer spring is 15 mm longer than the inner spring. The outer spring has 10 coils of mean diameter 40 mm and wire diameter 4 mm. When the spring is subjected to an axial load of 400 N. Find :

- i) Compression of each spring
- ii) Load shared by each spring and
- iii) Shear stress induced in each spring. Modulus of rigidity may be taken as 84 kN/mm². 8

- b) A pair of parallel helical gear consists of 20 teeth pinion meshing with 100 teeth gear. The pinion rotates 720 RPM. The normal pressure angle is 20°, while the helix angle is 25°. The face width is 40 mm and the normal module is 4 mm. The pinion is made of plain carbon steel 55C8 ($S_{ut} = 720 \text{ N/mm}^2$) while the gear is made of plain carbon steel 40C8 ($S_{ut} = 580 \text{ N/mm}^2$). The pinion and gear are heat treated to a surface hardness of 350 BHN and 300 BHN respectively. The service factor and factor of safety are 1.5 and 2.0 respectively. Assuming the velocity factor accounts for dynamic load, calculate the power transmitting capacity of helical gear pair. Use following data :

$$\text{Velocity factor, } K_v = \frac{5.6}{5.6 + \sqrt{V}}.$$
8

9. a) A cone clutch with asbestos lining is used to transmit 15 kW power at 1440 RPM. The coefficient of friction between the contacting surfaces is 0.3, while the permissible intensity of the pressure is 0.23 N/mm². The semicone angle is 12.5°. The mean radius of the friction surface is twice the face width. Assuming the uniform pressure condition, determine :
- i) The dimensions of the friction surface
 - ii) The axial force required to engage the clutch ; and
 - iii) The axial force required to disengage the clutch. 8



b) Write a short note on following :

- i) Design of solid disc flywheels
- ii) Design of rimmed flywheels.

8

OR

10. a) 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 inner dead centre position. The resisting torque of the machine is constant throughout the work cycle. The coefficient of fluctuations of speed 0.01, while the mean speed is 150 RPM. A solid circular steel disk of thickness 50 mm is used as a flywheel. If the mass density of steel is 7800 kg/m^3 , calculate the diameter of the flywheel disk.

8

b) What are the requirements of good friction clutch ?

8

11. a) A transmission shaft is supported by two deep groove ball bearings at two ends. The centre distance between the bearings is 150 mm. A load of 500 N acts vertically downwards at 70 mm distance from the left hand bearing whereas a load of 800 N acts horizontally at 50 mm distance from the right hand bearing. Shaft speed is 3000 RPM and expected life of the bearings is 8000 hours with a reliability of 95%. It is intended to use the same bearings at both ends of the shaft. Calculate dynamic load rating of the bearings so that it can be selected from manufacturer's catalogue.

8

b) Derive Reynolds equation in two dimensional form for Hydrodynamic journal bearings with usual notations.

10

OR



12. a) The following data is given for a 360° hydrodynamic bearing :

Radial load = 3200 N

Journal diameter = 50 mm

Bearing length = 50 mm

Journal speed = 1490 RPM

Radial clearance = 50 microns

Viscosity of the lubricant = 25 cP

Density of the lubricant = 860 kg/m^3

Specific heat of lubricant = $1.76 \text{ kJ/kg}^\circ\text{C}$

Assuming that the total heat generated in the bearing is carried by the total oil flow in the bearing; calculate

- i) The minimum oil film thickness
- ii) The coefficient of the friction
- iii) The total flow rate of lubricant in lpm ; and
- iv) The temperature rise.

8

Table 1 : Dimensionless parameters for 360° Hydrodynamic journal bearings :

L/D	h_0/C		ϵ S	$(r/C).f$	$(Q/r.Cn_s L)$	Q_s/Q	P_{max}/P
1.0	0.2	0.8	0.0446	1.70	4.62	0.842	3.195
	0.4	0.6	0.121	3.22	4.33	0.680	2.409
	0.6	0.4	0.264	5.79	3.99	0.497	2.066



b) A single deep groove ball bearing operates with the following work cycles :

Element No.	Element Time, %	Radial Load, Fr, kN	Thrust Load, Fa, kN	Radial Factor 'X'	Thrust Factor 'Y'	Race Rotating	Service Factor	Speed RPM
1	50	3.0	1.0	0.56	1.4	Inner	1.5	720
2	20	2.5	1.0	0.56	1.6	Outer	2.0	1440
3	Remaining	No Load	No Load	--	--	Outer	--	720

If the expected life of the bearing is 15000 hours with a reliability of 95%, calculate the basic dynamic load rating of the bearing so that it can be selected from the manufacturer's catalogue based on 90% reliability. If there are six such bearings in a system, what is the probability that all bearings will survive for 15000 hours ?

10



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**T.E. (Semester – I) (Mechanical) Examination, 2011
DESIGN OF MACHINE ELEMENTS (2003 Course)**

Time : 4 Hours

Max. Marks : 100

- Instructions :** 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) Black 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

1. a) What different parameters are considered while selecting material for a mechanical component ? **4**
- b) Why safety aspect is important in design ? How is it incorporated in design ? **4**
- c) A crane hook manufacturer says that he currently has produced hooks for cranes having pay load capacities of 10 kN, 16 kN, 25 kN, 40 kN, 63 kN and 100 kN. Next year he is going to expand his business by producing additional hooks for cranes having pay load capacities of 12.5 kN, 20 kN, 31.5 kN, 50 kN and 80 kN. State the series of preferred numbers he has used this year and the series he will be adopting for next year. **2**
- d) A bolt joining two plates is tightened with a pre-load of 5 kN. Determine the factors of safety based on maximum shear stress theory and maximum principal stress theory, if the load applied on plates creates a shearing load of 10 kN on the bolt. The stress area of the bolt is 125 mm² and the material for the bolt is 30C8. **8**

OR

P.T.O.



2. a) Design pin of knuckle joint shown in Figure – 1 considering crushing, shearing, bending failures, assuming factor of safety to be 3 and assuming material for pin to be 30C8.

8

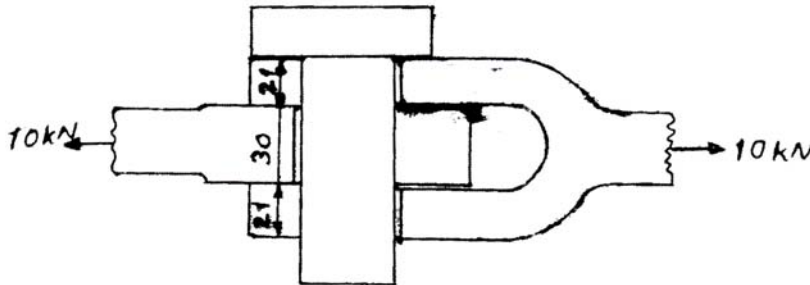


Figure – 1 Q. 2(a)

- b) Material for C-frame shown in Figure – 2(a) is FG200. Determine the size of cross section assuming factor of safety to be 2. Further, determine factor of safety if the C-frame is replaced with a semi-circular bar having circular cross section with cross sectional area and material same as that of the C-frame. Refer Figure – 2(b) for size of semicircular bar.

10

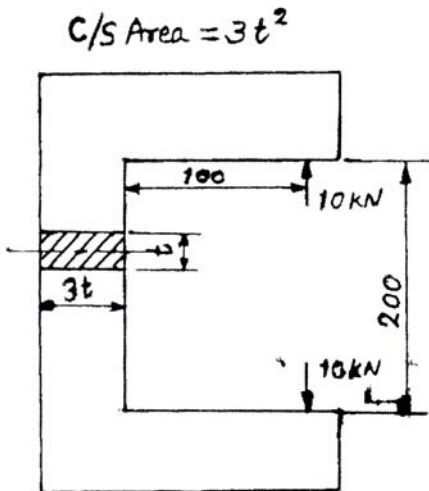


Figure – 2(a) Q. 2(b)

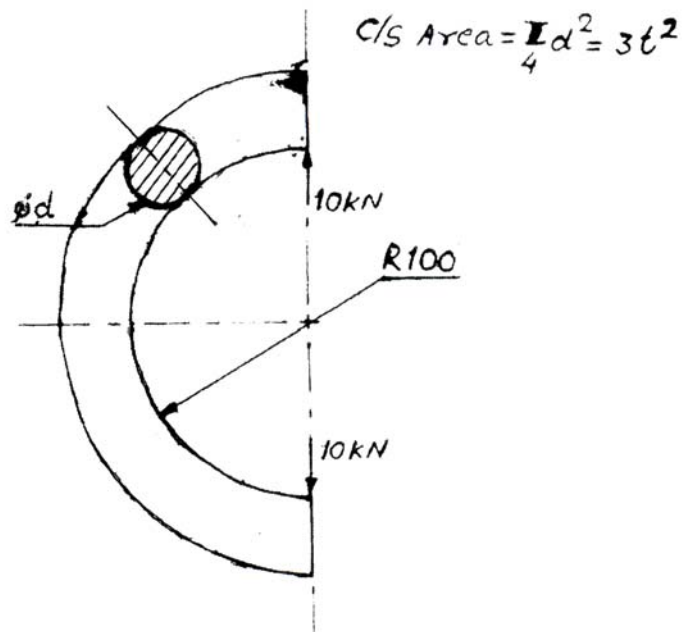


Figure – 2(b) Q. 2(b)



3. A hollow shaft simply supported between two bearings 1 m apart has outside and inside diameters 70 mm and 40 mm respectively. Determine the maximum radial load it can carry at a distance of 400 mm from one end, if it is made of an alloy steel 40 Ni3 assuming absence of keyways. The torque acting on the shaft is 500 Nm and the combined shock and fatigue factors may be assumed as $K_b = 1.7$ and $K_f = 1.3$. Determine lateral deflections of shaft at the midpoint and at the point of application of radial load using Castigliano's theorem. 16

OR

4. a) A transmission shaft is used to transmit power of 30 kW at 700 rpm. Design the diameter of shaft if it is made of plain carbon steel 40C8 and the permissible angle of twist is 4 degrees/metre length. What will be the angle of twist per metre length if the shaft is made hollow with the same outside diameter and inside diameter equal to the outside radius ? 6
- b) A standard spline connection 8×52×60 is used for a gear having hub length 120 mm mounted on a splined shaft in a gear box assembly. Determine the maximum power that may be transmitted by the gear if the normal pressure between splines is limited to 5 N/mm² and the gear rotates at 500 rpm speed. Also determine the axial force required to shift the gear if coefficient of friction between splines is 0.08. 6
- c) A shaft having diameter 60 mm is used to transmit torque of 500 Nm. Determine factors of safety for key in crushing and shearing if
- i) Single rectangular key 18×11×80 used
 - ii) Two square keys 5×5×80 are used in Kennedy key arrangement. 4
5. a) Figure – 3 shows a plate bolted to support by means of four identical bolts made of chromium-molybdenum steel. Design the heavily stressed bolt with min. factor of safety equal to 4. 12

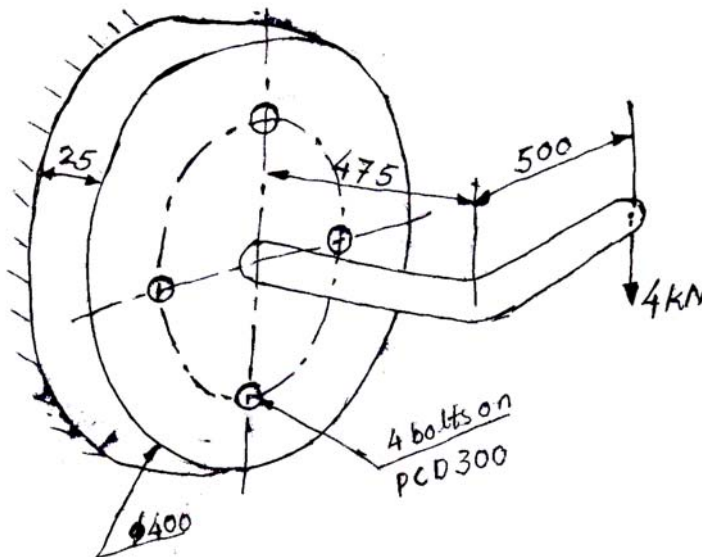


Figure – 3 Q. 5(a)

- b) What is a bolt with uniform strength ? Explain with sketch. 4
- OR



6. a) Derive expression for moment of inertia of a circular weld for a circular rod welded to support as shown in Figure 4. Further determine leg length of the weld, if permissible shear stress in the weld material is 50 N/mm^2 . **12**

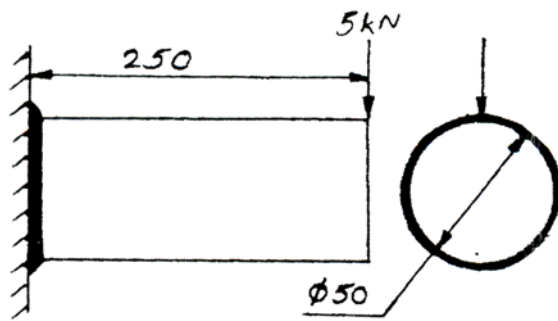


Figure – 4 Q. 6(a)

- b) Compare advantages and disadvantages of welded joints with threaded joints. **4**

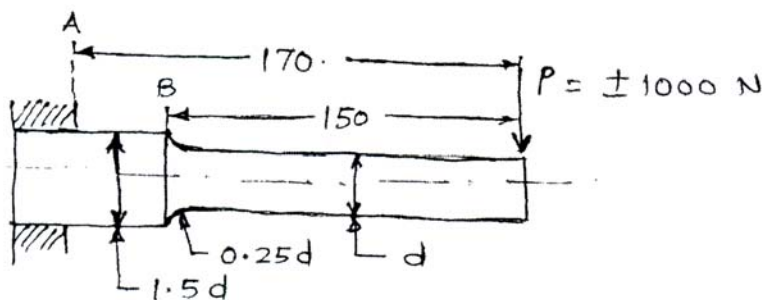
SECTION – II

7. a) Why are square threads preferable to v-threads for power transmission ? **3**
- b) What is self locking property of threads and where is it necessary ? **3**
- c) A power screw having double start square threads of 25 mm nominal diameter and 5 mm pitch is acted upon by an axial load of 10 kN. The outer and inner diameter of screw collar are 50 mm and 20 mm respectively. The coefficient of thread friction and collar friction may be assumed as 0.2 and 0.15 respectively. The screw rotates at 12 r.p.m. Allowable thread bearing pressure is 5.8 N/mm^2 . Calculate :
- Power required to rotate the screw **3**
 - The principal shear stress in screw body **3**
 - The transverse shear stresses in screw and nut **4**
 - The number of threads of nut in engagement with screw. **2**

OR



8. a) Derive the expression for maximum efficiency of square threaded screw and show that the efficiency of self locking screw is less than 50 percent. **7**
- b) The screw of a shaft straightener exerts a load of 30 kN. The screw is square threaded of outside diameter 75 mm and 6 mm pitch. Determine :
- i) Force required at the rim of a 300 mm diameter hand wheel, assuming the coefficient of friction for the threads as 0.12. **3**
 - ii) Maximum compressive stress in the screw. **2**
 - iii) Bearing pressure on the threads. **2**
 - iv) Maximum shear stress in the threads. **2**
 - v) Efficiency of the straightener if the nut length is 150 mm. **2**
9. a) What is stress concentration ? State and explain various causes of stress concentration. Suggest suitable remedies to reduce stress concentration. **6**
- b) A Cantilever beam made of cold drawn steel 20 C8 is subjected to completely reversing load of 1000 N as shown in Fig. Q. 9(b). The notch sensitivity factor at the fillet can be taken as 0.85 and expected reliability is 90%.
Surface finish factor = 0.79
Size factor = 0.85
Reliability factor = 0.897
Theoretical stress concentration factor = 1.33
Determine the diameter 'd' for a life of 10000 cycles. **10**



OR



10. a) Write a short note on cumulative damage in fatigue failure. 4
- b) A transmission shaft carries a pulley midway between the two bearings. The bending moment at the pulley varies from 200 N-m to 600 N-m, as the torsional moment in the shaft varies from 70 N-m to 200 N-m. The frequencies of variation of bending and torsional moment are equal to the shaft speed. The shaft is made of steel having ultimate tensile strength = 540 N/mm² and yield strength in tension = 400 N/mm². The corrected endurance strength of the shaft is 200 N/mm². Determine the diameter of the shaft using a factor of safety of 2. 12
11. a) Write a note on shot peening. 4
- b) A concentric spring for an aircraft engine valve is to exert a maximum force of 5000 N under an axial deflection of 40 mm. Both the springs have same free length, same solid length and are subjected to equal maximum shear stress of 850 MPa. If the spring index for both the springs is 6.
- Determine :
- i) The load shared by each spring. 4
- ii) Diameter of spring wires and mean diameter of springs. 4
- iii) The number of active coils in each spring.
- Consider square and ground ends for the spring. 4
- Assume $G = 80 \text{ kN/mm}^2$ and diametral clearance to be equal to the difference between the wire diameters.
- OR
12. a) Draw a neat sketch of leaf spring and explain briefly function of its each component. 4
- b) Write a note on Nipping of leaf spring. 4



c) For a helical torsion spring subjected to a torque of 6 N-m, the spring gets deflected by 90° . If the allowable stress is 450 MPa and Modulus of Elasticity and Modulus of rigidity for spring material are 200 GPa and 80 GPa respectively. Determine :

- i) Mean diameter of spring
- ii) Diameter of spring wire
- iii) Number of active turns

Assume a spring index of 6.

8

Design Data

1. Material properties :

Sr.	Material	Designation	Sut (MPa)	Syt (MPa)
1	Plain Carbon Steel	10 C4	333	206
2	Plain Carbon Steel	20 C8	540	220
3	Plain Carbon Steel	30 C8	500	400
4	Plain Carbon Steel	40 C8	580	380
5	Alloy Steel	40 Ni3	780	580
6	Alloy Steel	40 NiCr1M015	780	580
7	Grey Cast Iron	FG200	200	–

2. Common properties :

Sr.	Material	E (GPa)	G(GPa)
1	Steel	206	80
2	Cast Iron	114	46



3. Strengths of steel :

The relation may be assumed as

$$S_{yt} = S_{yc} = 2 S_{ys}$$

4. Basic dimensions for I.S.O. metric threads.

Series	Designation	Nominal dia (mm)	Pitch (mm)	Tensile Stress Area (mm ²)
Coarse	M10	10	1.50	58.00
	M12	12	1.75	84.30
Fine	M10×1.25	10	1.25	61.20
	M10×1.00	10	1.00	64.50
	M12×1.50	12	1.50	88.10
	M12×1.25	12	1.25	92.10



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T.E. (Petrochemical Engineering) (Semester – I) Examination, 2011
PROCESS AND ANALYSIS INSTRUMENTATION
(2003 Course)

Time : 3 Hours

Max. Marks : 100

- Instructions :** 1) Attempt Q. 1 or 2, Q. 3 or 4, Q. 5 or 6, Q. 7 or 8, Q. 9 or 10, Q. 11 or 12.
2) Figures to the **right** indicate **full** marks.
3) Use of electronic calculators, steam table is **allowed**.
4) **Draw** neat sketch **wherever** necessary.

SECTION – I

1. A) a) Explain the types of measurement uncertainties in detail. **8**
b) Define : Accuracy, Precision, Repeatability, Reproducibility, Hysteresis, Drift, Fidelity, Dead zone. **8**

OR

2. B) a) Give the classification of the measuring instruments. **8**
b) Explain hierarchy of standards and calibration. **8**
3. A) a) Explain the principle, construction and working of a radiation pyrometer. **8**
b) Explain pressure measurement using different types of manometers. **8**

OR

4. B) a) Explain the various types of level indicators using magnetic properties. **8**
b) Write a note on electromagnetic flow meter. **8**
5. A) a) Explain the use of psychrometric chart. **6**
b) What do you mean by 'inherent characteristics' of control valves ? **6**
c) Write a note on the programmable logic controller. **6**

OR

6. a) Write a note on hygrometer. **6**
b) What are the factors to be considered while selecting a control valve ? **6**
c) Explain feed back control loop in automatic process control. **6**

P.T.O.



SECTION – II

7. a) Give the principle and working of HPLC. **8**
b) Describe types of detectors used in gas chromatography. **8**

OR

8. a) Explain composition analysis using refractive index method. **8**
b) Describe the various sampling techniques. **8**
9. a) Why is the internal standard procedure seldom used in atomic absorption procedures ? Give the procedure. **10**
b) How will you determine lead in petrol using atomic Absorption Spectroscopy ? **8**

OR

10. a) Write a note on X ray diffraction method used for composition analysis. **8**
b) What is the principle and applications of NMR ? Define Chemical Shift; Spin Spin coupling ' equivalent hydrogen' integral curve. **10**
11. a) Discuss total hydrocarbon analysis. **8**
b) Explain the method of analysis using thermal conductivity. **8**

OR

12. a) Describe briefly the characteristics of an optically active substance. **8**
b) Write a note on the mass spectrometer. **8**



[4063] – 119

T.E. (Petrochemical) (Semester – II) Examination, 2011
TRANSPORT PHENOMENA
(2003 Course)

Time : 3 Hours

Max. Marks : 100

- Instructions :* 1) Attempt **any 3** question from **each** Section.
2) Figures to the **right** indicate **full** marks.
3) Use of electronic calculators is **allowed**.
4) Draw **neat sketch wherever** necessary.

SECTION – ONE

1. a) Explain Momentum transfer in a fluid. Ethyl alcohol with viscosity 0.019 g/cm.s, is flowing through two parallel flat plates separated by a distance of 0.6 cm, at 273 K. The velocity of lower plate is 12 cm/s while upper plate velocity is stationary. Calculate the shear stress and velocity gradient. **8**
- b) Explain different time derivatives giving example and corresponding expressions. **8**
2. a) What is a control volume ? Derive continuity equation with Eulerian approach and define each of the constituent terms in the equation. **10**
- b) Explain the physical interpretation of Navier Stokes equation for conservation of momentum and conservation of energy respectively. **8**
3. a) Carbon Tetrachloride with density and viscosity of 2 gm/cc and 0.9 c.p. respectively is to flow through a smooth horizontal circular tube of diameter 4 cm at a volumetric flow rate of 3 liter per second at 25°C. Estimate the pressure drop per unit length of the tube. Give the check for units consistency in the solution. **8**
- b) What do you mean by Reynolds stresses ? Explain with significance Prandtl's Mixing Length theory. **8**

P.T.O.



4. a) Explain various types of impellers with respect to their design, operational features and applications. **8**
- b) A flat-blade turbine agitator with disk having flat six blades is installed in a tank. The tank diameter is 1.9 m, the turbine diameter is 0.7 m, the width is 0.13 m and the depth of the liquid in the tank is equal to its diameter. The tank contains four baffles, each having a width of 0.14 m. The turbine is operated at 100 rpm and the liquid has a viscosity of 12 cp and a density of 950 kg/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. **8**

SECTION – TWO

5. a) Write a short note on heat transfers in Agitated Vessels. **10**
- b) Derive the expression for the time required for a batch heating with a non-isothermal heating medium. **6**
6. a) Derive an approximate method from Reynolds Analogy for momentum, heat and mass transfer for evaluating mass transfer coefficient if heat transfer coefficient is known. **8**
- b) Air at 330 K, flowing at 10 m/s, enters a pipe of inner diameter 25 mm, maintained at 415 K. The drop of static pressure along the pipe is 80 N/m^2 per meter length. Using the Reynolds analogy between heat transfer and fluid friction, estimate the air temperature 0.6 m along the pipe. **8**
7. a) What is Computational Flow Modeling ? Explain in detail what are the steps involved in a typical flow-modeling project. **10**
- b) Explain the basic elements in mapping a computational flow model onto a CFD tool. **8**
8. Write a short note on **any four** of the following : **16**
- a) Dimensionless numbers in Chemical engineering
 - b) Classification of Partial Differential Equations
 - c) Advantages and limitations of CFD
 - d) Static Mixers
 - e) Phase coupling in multiphase systems.



[4063] – 127

T.E. (Polymer Engineering) (Semester – II) Examination, 2011
POLYMER MATERIALS – II
(2003 Course)

Time : 3 Hours

Max. Marks : 100

- Instructions :** 1) *All questions are compulsory.*
2) *Answer to the two Sections should be written in separate books.*
3) *Figures to the right indicate full marks.*

SECTION – I

1. a) Give a typical formulation of phenolic resin. Discuss the role of any two components in it. **8**
b) Give the compounding and applications of epoxy resins. **8**

OR

1. a) Enlist the properties of cured unsaturated polyester resin. Correlate the applications with properties. **8**
b) What are amino resins ? Give the formulation for any one type of amino resin. **8**
2. a) Discuss formulation, compounding and properties of silicone resin. **8**
b) Write a note on properties and applications of polyimide resin. **9**

OR

2. a) Give the properties of cured furan resins. **8**
b) Give the applications of polyurethane resins. **9**
3. a) Write a note on thickening agents used in adhesives. **8**
b) Mention and describe any three type of pigments used in paint manufacture. **9**

OR

3. a) Give two applications each for varnish, lacquer, enamel and primer. **8**
b) Write a note on various types of adhesives. **9**

P.T.O.



SECTION – II

4. a) Define elastomers. Discuss the requirements of the material to show elastomeric properties. **8**
b) Explain the processing of latex. **8**

OR

4. a) Write a note on molecular requirements for rubbery polymers. **8**
b) Justify how mastication leads to uniform molecular weight distribution. **8**
5. a) Explain and differentiate activators and accelerators. **8**
b) With suitable examples explain the working of plasticizers. **9**

OR

5. a) Write a note on mastication additives for rubber. **8**
b) Compare and contrast antioxidants and antiozonants in rubber. **9**
6. a) Explain curing behavior of natural rubber using any three curing agents. **8**
b) Write down the properties and applications of sulphochlorinated polyethylene rubber. **9**

OR

6. a) Discuss in detail thermoplastic elastomers. **8**
b) Write a note on nitrile rubber compounding. **9**



[4063] – 140

T.E. (Computer Engineering) (Semester – II) Examination, 2011
SOFTWARE ENGINEERING
(2003 Course)

Time : 3 Hours

Max. Marks : 100

SECTION – 1

1. a) What is Software Process and Software Engineering ? Explain different layers of Software Engineering. **8**
- b) Explain the difference between Specific Goals and Specification Practices with example. **6**
- c) “Incremental Model is useful when staffing is unavailable for complete implementation by business deadline”, explain whether given statement is true or false. **3**

OR

2. a) What is Process Pattern ? Explain the template for process pattern proposed by Ambler. **9**
- b) Explain Spiral Model with its advantages and disadvantages. **8**
3. a) Explain the core principles of Software Engineering Practices. **8**
- b) What are the objectives of Software Testing ? Explain different Testing Principles. **9**

OR

4. a) Explain the importance of system modeling. Explain different factors that should be considered while constructing system model. **9**
- b) What is the goal of Business Process Engineering ? Explain different architectures that are defined and developed as part of BPE. **8**

P.T.O.



5. a) What is QFD ? Explain different types of requirements identified by QFD. **8**
- b) Explain the concept of DFD ? Draw Level 0, Level 1 and Level 2 DFD for Inventory Management System. **8**

OR

6. a) Explain with example-scenario based modeling approach. **8**
- b) Draw use case diagram for a bank's withdrawal operation. **8**

SECTION – 2

7. a) What is Transaction mapping ? State and explain the design steps for transaction mapping. **9**
- b) Explain Interface Analysis. What are the steps involved in interface analysis ? **8**

OR

8. a) In architectural context diagram, how do the system interoperate with one another ? **8**
- b) What is coupling ? What are the different categories of coupling ? **9**
9. a) Explain in detail following Black Box testing methods. **9**
- i) Equivalence partitioning
 - ii) Boundary value analysis
 - iii) Orthogonal Array Testing.
- b) What are unit testing considerations ? What are the problems associated with Top-down integration ? **8**

OR



10. a) What is meant by testing surface structure and Deep structure ? How partition testing is performed at class level ? **9**
- b) What is the difference between Verification and Validation ? What are the outcomes of verification and validation testing ? **8**
11. a) Explain in detail the product metrics landscape. **8**
- b) What are measurement principles ? Explain in detail goal-oriented software measurement. **8**
- OR
12. a) Define Quality. Explain how software quality is associated with phases of SDLC. **8**
- b) Explain the metrics for source code. What are the factors affecting source code metric investigation ? **8**
-



[4063] – 142

T.E. (Information Technology) (Semester – I) Examination, 2011
MULTIMEDIA SYSTEMS
(2003 Course)

Time : 3 Hours

Max. Marks : 100

- Instructions :** 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 should 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

1. a) What is the need of a multimedia systems ? Explain any one of the authoring tools in detail. 8
- b) Explain :
- i) Need of display buffer
- ii) Magnetic storage device. 8
- OR
2. a) What are the different building blocks of multimedia ? Explain with the help of examples. 8
- b) Write short notes on : 8
- i) Optical Devices
- ii) Scanners.
3. a) Explain the Bresenham's Line Drawing algorithm. Write the sequence of pixels which will be turned on for a line segment with end points $L_1 (0, 0)$ and $L_2 (5, 10)$. 8
- b) Consider a square with vertices as A(1, 0), B(0, 0), C(0, 1), D(1, 1). Perform the following 2-D transformations. 8
- i) Rotation by 30 degree about point D.
- ii) Scale in y direction by factor 2.

OR

P.T.O.



- 4. a) With the help of an example-explain the Bresenham's circle drawing algorithm. **8**
- b) Explain Cohen Sutherland algorithm for 2-D line clipping. **8**
- 5. a) Explain the steps of performing rotation of a point P(x, y) about axis parallel to x-axis. **9**
- b) What is aliasing and antialiasing ? Explain with a suitable example. **9**

OR

- 6. Write short notes on : **18**
- a) Phong shading
- b) Polygon clipping
- c) Flood fill.

SECTION – II

- 7. a) What is audio compression ? Explain DPCM in detail. **8**
- b) What is MIDI ? Explain MIDI file format. **8**

OR

- 8. a) Explain wave file format in detail. **8**
- b) What is VOC ? Explain in detail. **8**
- 9. a) What is animation ? Explain any four principles of animation with examples. **8**
- b) Compare RGB and CMY color models. **8**

OR

- 10. a) Compare NTSC and SECAM video standards with respect to all the features. **8**
- b) What are the types of animation ? Illustrate with suitable example. **8**
- 11. a) Explain different types of loss less compression techniques in brief. **10**
- b) Explain hybrid compression technique. **8**

OR

- 12. a) Write features of MPEG1, MPEG2 and MPEG4. **10**
- b) Explain BMP file format in detail. **8**



[4063] – 146

**T.E. (Information Technology) (Semester – II) Examination, 2011
COMPUTER NETWORK TECHNOLOGY (2003 Course)**

Time : 3 Hours

Max. Marks : 100

Instructions : 1) Answer 3 questions from Section I and 3 questions from Section II.

2) Neat diagrams must be drawn wherever necessary.

3) Assume suitable data, if necessary.

SECTION – I

1. A) What is routing ? Explain the difference between link state routing and distance vector routing. 8
- B) Differentiate between Intra-domain and Inter-domain routing protocols, giving one example of each. 8

OR

2. A) What are the different classes of IP addresses ? Explain the concept of private IP addresses. Where and why the NAT is used ? 8
- B) Design a class-B network of eight equal subnets with at-least 60 computers in each subnetwork. 8
3. A) What is a socket ? Explain various socket primitives used in client-server interaction. 8
- B) Explain in detail how TCP provides a flow control. 8

OR

4. A) How Nagle's algorithm helps in TCP transmission policy ? Explain the Clark's solution to overcome the silly window syndrome. 8
- B) What is a congestion control mechanism ? Explain leaky bucket and token bucket algorithms. 8
5. A) Explain various resource records used in DNS. 9
- B) Explain Static, Dynamic and Active pages by giving one practical example of each. 9

OR

P.T.O.



6. Write short notes on : 18
- 1) MIME
 - 2) FTP
 - 3) Wireless web

SECTION – II

7. A) Interactive audio/video uses RTP and RTCP. What role do these protocols play ? 8
- B) Why do we require a different protocol for streaming stored audio/video ? Explain in detail the protocols required. 8

OR

8. A) Differentiate SIP and H.323. 8
- B) What is RSVP ? Why is it required ? 8
9. A) List and explain the principal components of network management architecture. 8
- B) Explain and compare DHCP and BOOTP. 8

OR

10. A) List 5 areas of network management and explain the necessity of each. 8
- B) Explain MIB along with its structure. 8
11. Write short notes on : 18
- 1) B-ISDN
 - 2) X-25
 - 3) Bluetooth protocol stack.

OR

12. Write short notes on : 18
- 1) 802.11
 - 2) ATM architecture
 - 3) Frame relay.



[4063] – 148

T.E. (Information Technology) (Semester – II) Examination, 2011
HUMAN COMPUTER INTERFACE
(2003 Course)

Time : 3 Hours

Max. Marks : 100

- Note :* 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

1. a) What is reasoning ? Explain different types of reasoning with examples. **8**
- b) Compare life critical system against commercial computer systems with reference to goals of user interface design. **8**

OR

2. a) Discuss human factors related metrics to evaluate any interface. **8**
- b) Explain the difference between slips and mistakes with the help of suitable example. **8**
3. a) Explain stages of action model. Define gulf of evaluation and gulf of execution. **10**
- b) Explain task objects and task actions as well as interface objects and interface actions to build computer interface for any one of the following systems : **8**
- Book Management System
 - Hotel Management System.

OR

P.T.O.



- 4. a) Explain GOMS and keystroke level model. 10
- b) List and explain “Eight golden rules of interface design”. 8
- 5. a) Draw and explain three Pillars of Interface Design. 8
- b) Explain how scenarios help in the design process of interactive system. 8

OR

- 6. Write short note on : 16
 - Participatory Design
 - LUCID.

SECTION – II

- 7. a) Explain different dialog design notations. 8
- b) What are different issues while designing multiple window interfaces for an application ? 8

OR

- 8. a) Explain advantages and disadvantages of direct manipulation with the help of example. 8
- b) List and explain various interaction styles. 8
- 9. a) Explain how Meeting Rooms and Shared Drawing Surfaces are useful in CSCW systems for co-operative working. 8
- b) Discuss important issues involved in designing a web page. 8

OR

- 10. a) Explain an importance of hypertext over linear paper document. List important considerations for creating a good hypertext document. 8
- b) Explain the guidelines for developing good error messages. 8



11. a) Some of the favorite techniques of web pages these days include automatic scrolling text boxes, moving marquees, and constantly running animations (e.g. for icons). Discuss these features in terms of web design guidelines. **10**
- b) Give four benefits and three problems of touch screens and voice recognition input. **8**

OR

12. Write short notes on : **18**
- i) Ethnographic observation
 - ii) Scenarios and Patterns
 - iii) Role of HCI in animation industry.



[4063] – 18

T.E. (Mechanical) (Semester – II) Examination, 2011
FLUID MACHINERY
(2003 Course)

Time : 3 Hours

Max. Marks : 100

- Instructions :** 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** books.
4) **Neat** diagrams must be drawn **wherever** necessary.
5) **Black** figures to the **right** indicate **full** marks.
6) Use of logarithmic tables, slide rule, Moillier charts, electronic pocket calculator and steam tables is **allowed**.
7) Assume suitable data, if **necessary**.

SECTION – I

1. a) Explain the various efficiencies of a hydraulic turbine. **6**
- b) A jet of water makes an angle ‘ α ’ with the direction of motion of series of moving blades. If the blade angle at inlet and outlet are θ and ϕ with the direction of motion, derive an expression for the work done. Assume the ratio of relative velocity at the outlet to that at inlet as ‘K’. There is no shock at entry. Show that the maximum efficiency is

$$\eta_{\max} = \frac{\cos^2 \alpha}{2} \left[1 + \frac{k \cos \phi}{\cos \theta} \right]. \quad \mathbf{12}$$

OR

P.T.O.



2. a) A jet has a impact on a series of flat plates mounted on a wheel. Find the expression for force acting on the plate and efficiency of system. **9**
- b) A jet with a velocity of 40 m/s strikes a blade moving with a velocity of 20 m/s. The jet makes an angle of 30° with the direction of motion of the blade at inlet and leaves at angle 90° to the direction of motion of the blade at outlet . Find out the blade angles at inlet and outlet so that the water enters and leaves the blade without shock. **9**
3. a) Explain the significance of speed ratio, flow and jet ratio. **6**
- b) A double jet Pelton wheel required to develop 5400 kW power has specific speed of 20 and is supplied through a pipe line 800 m long from a reservoir, the level of which is 350 m above the nozzles. Allowing 5% friction loss in the pipe. Find
- rotational speed
 - diameter of jets
 - mean diameter of bucket circle
 - diameter of supply pipe
- Take bucket speed = 0.46 jet speed
 $C_v = 0.98$ and overall efficiency = 85%, and friction factor for pipe = 0.024. **10**
- OR
4. a) Compare impulse turbine with reaction turbines. **6**
- b) The blade of a single jet Pelton wheel runs at its optimum speed which is 0.46 times the jet speed. The overall efficiency of the machine is 0.85.
- Show that the dimensionless speed is $0.192 \frac{d}{D}$, where d is jet diameter and 'D' is wheel diameter. Take $c_v = 0.97$. **10**
5. a) The diameter of an inward radial flow turbine is 1.2 m and inward flow area is 0.5 m^2 . The head available is 150 m. The inlet vane angle and blade angle are 20° and 60° respectively. If the turbine is running at 500 rpm, find power developed by the turbine and hydraulic efficiency. Find discharge through the runner assuming it to be radial. **10**
- b) Explain the functions of draft tube and efficiency of draft tube. **6**

OR



6. a) The following data refers to elbow-type draft tube. The inlet area = 2.5 m^2 and outlet area = 11.6 m^2 , velocity of water at inlet to the draft tube = 8 m/s . Efficiency of draft tube = 0.7 . Elevation of inlet plane above draft tube = 2.5 m . Determine
- i) Vacuum at inlet
 - ii) Head wasted in draft tube and
 - iii) Power lost in tail race **10**
- b) Explain the governing of Francis turbine. **6**

SECTION – II

7. a) A test model of $1/4$ size is prepared to carry out the test for an actual turbine which has to develop 15 MW when head is 50 m and it has to run at 300 rpm . The head available in the laboratory is 10 m . Determine speed, power and flow rate passing through the model. Take $\eta_0 = 0.8$ for model and prototype. **10**
- b) Explain with a neat sketch the governing of Kaplan turbine. **8**

OR

8. a) A model of turbine is $1/5$ of prototype and it is tested under available head of 10 m . The prototype has to run under the head of 40 m at 400 rpm . Find the speed of model if it develops 100 kW when the quantity of water supplied is 1500 lps .
- Also find the power developed by prototype. Also determine overall efficiency for model and prototype. **10**
- b) Explain the various unit quantities. **8**
9. a) Show that from first principle, the pressure rise through the impeller of centrifugal pump is given by

$$\Delta P = \frac{1}{2g} \left[Vf_1^2 + u_2^2 - Vf_2^2 \operatorname{cosec}^2 \phi \right] \quad \mathbf{8}$$



- b) A centrifugal pump is coupled with diesel engine running at 1000 rpm. The water enters the pump radially and velocity of flow is constant. The outside and inside diameter of impeller are 20 cm and 40 cm. The inlet and exit blade angles are 20° and 30° width of vane at inlet = 2cm. Take overall efficiency = 70% and mechanical efficiency = 90%. Find the discharge through pump and input power given by diesel engine. 8

OR

10. a) Prove that the minimum speed required for centrifugal pump to start is given by

$$N = \frac{120}{\pi} \frac{V a_2 D_2}{(D_2^2 - D_1^2)} \eta_{\text{mano}} \quad 8$$

- b) The inner and outer diameters of an impeller of a centrifugal pump are 25 cm and 50 cm respectively. The velocity of flow at outlet is 1.5 m/s and vane angle at outlet is 60° . If manometric efficiency is 75%, find the minimum starting speed of centrifugal pump. 8

11. a) Explain effect of velocity variation on friction in suction and delivery pipes of reciprocating pump. 8

- b) A reciprocating pump takes water from 3 m deep and delivers at 45 m when running at 50 rpm. Its diameter and stroke are 18 cm and 36 cm respectively. Find the power required to drive the pump if mechanical efficiency is 85%. Also find discharge of pump. 8

OR

12. a) Explain with a neat sketch the working of hydraulic ram stating its advantages and limitations. 8

- b) Water at the rate of $1.2 \text{ m}^3/\text{min}$ supplied from a tank at a height of 4 m to hydraulic ram. The ram delivers $0.12 \text{ m}^3/\text{min}$ to a tank located at 25 m from the ram. Find the various efficiencies of hydraulic ram. 8



[4063] – 240

T.E. (Production Engg.) Examination, 2011
PRODUCTION METALLURGY
(Common to Production S/W)
(2008 Course)

Time : 3 Hours

Max. Marks : 100

- Instructions :** 1) Answer Q. 1 or Q. 2, Q. 3 or Q. 4, Q. 5 or Q. 6 from Section – I.
2) Answer Q. 7 or Q. 8, Q. 9 or Q. 10, Q. 11 or Q. 12 from Section – II.
3) Answers to the **two** Sections should be written in **separate** books.
4) **Neat** diagrams must be drawn **wherever** necessary.
5) **Black** figures to the **right** indicate **full** marks.
6) **Use** of logarithmic tables, slide rule, Mollier Charts, electronic pocket calculator and steam tables is **allowed**.

SECTION – I

1. a) Write all reactions of Fe – Fe₃C equilibrium diagram. What do you understand by A₁, A₃ and A_{cm} ? 6
b) Explain the following : 4
St E 25, En 8, 25C6, FeE 100 K
c) Explain the advantages of Electrolytic polishing with suitable examples. 4
d) Define Austenite, Pearlite, Ferrite and Cementite. 4

OR

2. a) Explain with a suitable graph, how mechanical properties of plain carbon steel vary with %C. 6
b) What do you understand by : 4
i) Resolving power ii) Total magnification
iii) Numerical aperture iv) Bright field illumination
c) Calculate the amounts of phases in AISI 1020 steel at room temperature, assuming equilibrium cooling condition. Draw the microstructure and define those phases. 6
d) How is the specimen prepared for microexamination ? 2

P.T.O.



3. a) What is hardenability ? Explain the factors influencing hardenability. 4
b) Draw T.T.T. diagram for eutectoid steel. 4
c) What is retained Austenite and how it can be eliminated ? 4
d) Distinguish between Annealing and Normalising. 4

OR

4. a) Explain secondary hardening and temper embrittlement. 4
b) What is tempering ? Discuss the stages of tempering. 4
c) Define Martensite. What are the characteristics of Martensitic transformation ? 4
d) Write short note on isothermal annealing. 4
5. a) Compare induction hardening and flame hardening. 4
b) Explain Nitriding with its advantages and disadvantages. 4
c) Explain Heat treatment after carburising. 6
d) What is carbonitriding ? 2

OR

6. Write short notes on : 16
- 1) Patenting
 - 2) Austempering
 - 3) Martempering
 - 4) Isoforming.

SECTION – II

7. a) What are the effects of adding Cr, W, Mo and Ni in alloy steels ? 5
b) Explain different types of stainless steels with its applications. 8
c) How is S.G. iron produced ? Draw its microstructure. 5

OR



8. a) Which alloy/tool steels would you recommend for the following applications and justify **(any 3)** : **7**
- i) Surgical instruments
 - ii) Milling cutter
 - iii) Plastic molding die
 - iv) Extrusion die for steel.
- b) Explain Heat treatment of HSS. **5**
- c) Write short notes on white cast iron and malleable cast iron. **6**
9. a) State one property, composition and one application of the following **(any 4)** : **12**
- i) LM 6
 - ii) Invar
 - iii) Muntz metal
 - iv) Gun metal
 - v) Monel
 - vi) Constantan
- b) What are the requirements of a bearing material ? **4**

OR

10. a) What is season cracking ? How it is eliminated ? **4**
- b) Give typical composition and uses of **(any 3)** : **6**
- i) Babbits
 - ii) German silver
 - iii) Alnico
 - iv) LM13
- c) What is equivalent zinc ? Explain with an example. **3**
- d) Describe effect of increase in Zn content on properties of brass. **3**



- 11. a) What is aspect ratio ? Explain effect of fiber length on tensile strength of composite. 4
- b) What are bio compatible materials ? Give some examples. 4
- c) Describe isostress and isostrain condition. 4
- d) How are boron fibres produced ? 4

OR

- 12. a) What are metal matrix composites ? Give typical uses. 4
- b) Explain any one production technique of fiber reinforced composite. 4
- c) Write a short note on Nano materials. 4
- d) How are reinforced composites produced ? 4



[4063] – 25

T.E. (Mechanical S/W) (Semester – II) Examination, 2011

THERMAL ENGINEERING – II

(2003 Course)

Time : 3 Hours

Max. Marks : 100

Instructions : 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) Black 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

1. a) Explain refrigeration system using Brayton cycle and show the state points on Temperature entropy diagram considering the irreversibilities. **8**

b) A carnot refrigerator operates between temperature of -40°C and $+40^{\circ}\text{C}$. Determine COP. It is desired to make the COP equal to 3.5 by changing temperatures. The increase (or decrease) in upper temperature is to be equal to the decrease (or increase) in lower temperature. Determine the new temperatures. **8**

OR

P.T.O.



2. a) Why is it necessary to pressurise the cabin in case of air refrigeration system ? **6**
- b) Find the theoretical cup for a refrigeration machine working between temperature range of 25°C and – 5°C. The dryness fraction of refrigerant used during suction stroke is 0.6. Following properties of refrigerant are given : **10**

Temperature (°C)	Liquid		Vapor		Latent heat kJ/kg
	Enthalpy kJ/kg	Entropy kJ/kg·k	Enthalpy kJ/kg	Entropy kJ/kg·k	
25	81.3	0.251	202.6	0.63	121.4
– 5	– 7.54	– 0.042	237	0.84	245.3

Unit – II

3. a) Prove that relative humidity ϕ is given by **6**

$$\phi = \frac{\mu}{1 - (1 - \mu) (P_s / P_b)}$$

where ϕ = relative humidity

μ = degree of saturation

P_s = Saturation pressure of vapor in moist air

P_b = Barometric pressure of moist air

- b) The barometer for atmospheric air reads 750 mm Hg, the DBT is 33°C, WBT is 23°C. Determine i) relative humidity ii) humidity ratio iii) DPT iv) density of atmospheric air. **10**

OR



4. a) Explain types of air condition systems. **6**
- b) Atmospheric air at 760 mm of Hg barometric pressure has 25°C DBT and 15°C WBT. With help of Psychrometric chart, determine i) relative humidity ii) humidity ratio iii) DPT iv) enthalpy of air per kg of dry air v) volume of air/kg of dry air. Check the results by psychrometric relations. **10**

Unit – III

5. a) Why is the air compressed in stages with intermediate water cooling preferably to the original temperature. Give the optimum values of intermediate pressure in following cases : **6**
- i) Two stage with perfect intercooling
- ii) Three stage with perfect intercooling.
- b) A two stage compressor draws in air at 1.01325 bar and 27°C and delivers it at 14.75 bar. The intercooling is perfect and compression and expansion indices are 1.25 for LP and 1.3 for HP stage. Determine optimum intermediate pressure, work during LP and HP stage and total work of both stages per kg for equal pressure ratio and perfect intercooling. **12**

OR

6. a) Derive an expression for polytropic efficiency of centrifugal compressor in terms of inlet pressure, delivery pressure, inlet temperature and ratio of sp heats. **9**
- b) With the help of neat sketches, explain a vane type of air compressor. How its PV diagram is different from a reciprocating air compressor ? **9**



SECTION – II

Unit – IV

7. a) Explain with the help of P- θ diagram various stages of combustion in SI engine. **8**
- b) Compare advantages and disadvantages of induction swirl and compression swirl. **8**

OR

8. a) Discuss the effect of following engine variables on flame propagation. **8**
- i) Fuel air ratio
 - ii) Compression ratio
 - iii) Engine load
 - iv) Turbulence.
- b) Explain the phenomenon of diesel knock. Compare it with phenomenon of detonation in SI engine. **8**

Unit – V

9. a) What is meant by constant pressure turbocharging ? What are its advantages and disadvantages ? What are limits of turbocharging ? **8**
- b) Compare Diesel engine and gasoline engine emission. What is meant by total emission control package ? **8**

OR



10. a) Describe with neat sketches following methods of petrol engine exhaust emission control.
- i) After burner method
 - ii) Exhaust manifold reactor. 8
- b) Name different superchargers used for supercharging of IC engines. Compare their merits and demerits and field of applications. 8

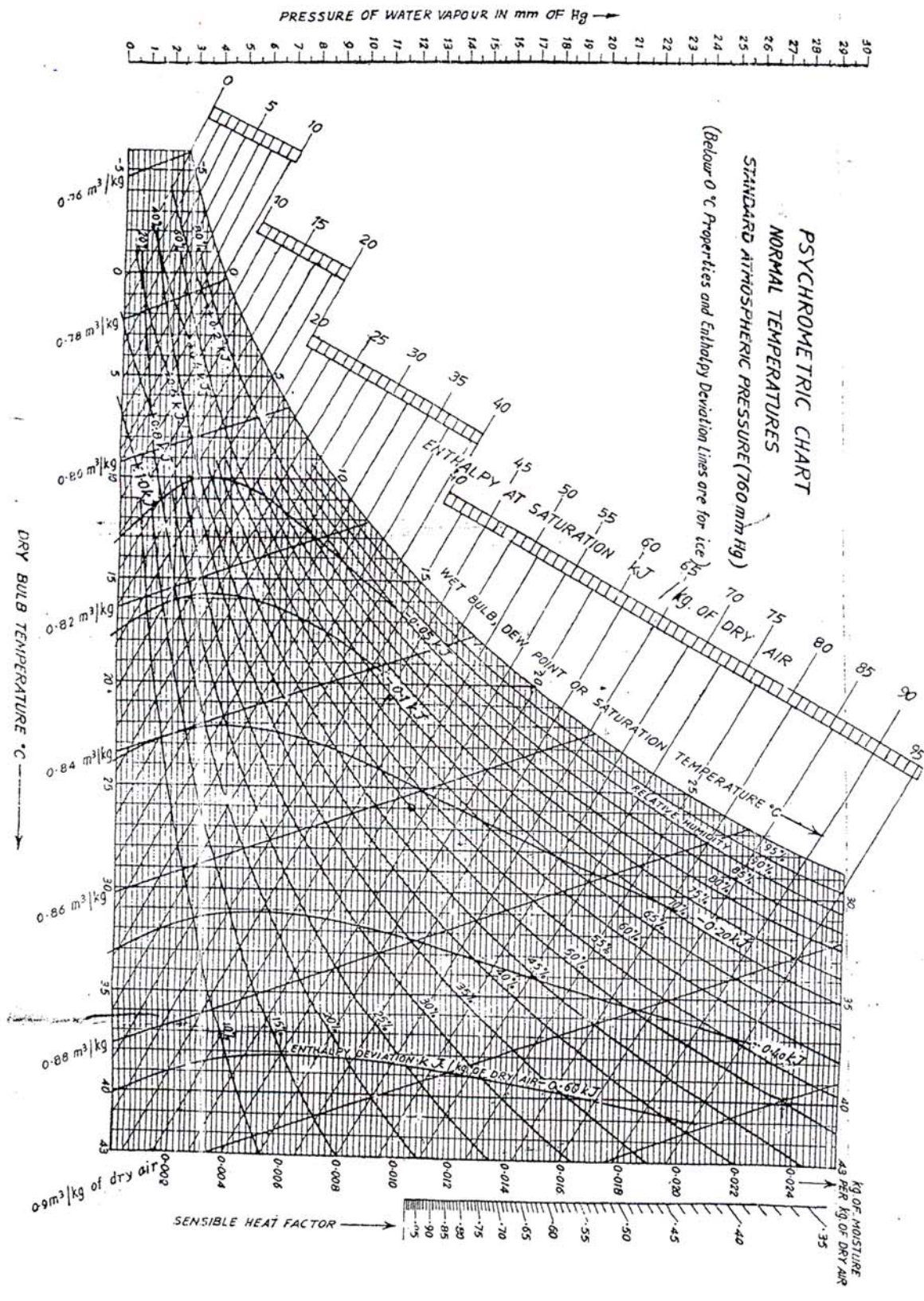
Unit – VI

11. a) Describe with neat sketch working of Ramjet, also state its merits and shortcomings. 6
- b) Explain following terms :
- i) Thrust
 - ii) Thrust power
 - iii) Propulsive efficiency
 - iv) Propulsive power. 6
- c) The turbojet engine requires fuel 0.18 kg per hour per N of thrust, when the thrust is 9 KN. The air craft velocity is 500 m/sec and mass of air passing through compressor of turbine is 27 kg/second. Determine the airfuel ratio, thrust power and overall efficiency of this unit. 6

OR



12. a) Discuss relative advantages and disadvantages of reciprocating IC engine and gas turbine. **5**
- b) Explain with neat sketch closed cycle gas turbine plant. **5**
- c) Determine efficiency of gas turbine plant fitted with heat exchanger of 75% effectiveness. The pressure ratio is 4 : 1 and compression is carried out in two stages of equal pressure ratio with intercooling back to initial temperature of 290 K. The maximum temperature is 925 K. The turbine isentropic efficiency is 88% and each compressor isentropic efficiency is 85%. Take for air $\gamma = 1.4$ and $C_p = 1.005 \text{ KJ/Kg K}$. **8**





[4063] – 294

T.E. Printing Examination, 2011
MANAGEMENT INFORMATION SYSTEM AND COST ESTIMATION
(2008 Pattern)

Time : 3 Hours

Max. Marks : 100

- Instructions :* 1) Answers to the **two** Sections should be written in **separate** books.
- 2) **Neat** diagrams must be drawn **wherever** necessary.
- 3) Black 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**.
- 6) **All** questions are **compulsory**.

SECTION – 1

1. A) Define the term objective. And also explain the term SMART objective with suitable example. 8
- B) Explain **any two** : 8
- | | |
|----------------|------------------------|
| a) Planning | b) Coordinating |
| c) Controlling | d) Directing |
| e) Organizing | f) Motivating/Staffing |

OR

1. A) Explain any two elements of Competitive Environment with suitable examples. 8
- | | |
|--------------|----------|
| a) Product | b) Price |
| c) Promotion | d) Place |
- B) Explain the characteristics of Sole proprietorship type of business organization along with its benefits and drawbacks. 8

P.T.O.



2. A) MIS is a life blood in today's business organization explain with suitable examples. 8
- B) Give suitable examples of type of information in four elements of competitive environment. 8

OR

2. A) Explain the terms Order Qualifier and Order Winner with suitable example. 8
- B) Differentiate between CIP3 and CIP4 technologies. 8
3. A) Explain **any two** : 9
- a) The Database
 - b) A Model base
 - c) DSS Software system.
- B) Explain the concept 'Decision Support System' with suitable example. 9

OR

3. A) Explain the concept 'Group Decision Support System' with suitable example. 9
- B) Differentiate between DSS and GDSS. 9

SECTION – 2

4. A) Explain the process of Decision Making. 8
- B) Explain **any two** : 8
- a) Data Definition Language (DDL)
 - b) Data Manipulation Language (DML)
 - c) Data Dictionary.

OR

4. A) Differentiate between Data Warehousing and Data Mining. 8
- B) Explain various types of Decisions. 8



5. ABC Ltd. uses job costing, the following data is obtained from the books for the year 31st December 2002

Direct material 60,000/-	Direct Wages 40,000/-
Factory Overheads 30,000/-	Office Overheads 26,000/-
S&D Overheads 39,000/-	Profit 48,750/-

In the year 2003, factory received an order for a no. of jobs, it is estimated that the material required will be 80,000/- and wages 50,000/-. What should be the price of the job if the factory wants to earn the same rate of profit on sales assuming that the S&D overhead has gone up by 10%. The factory recovers factory overhead as % of direct wages and office, S&D overhead as % of factory cost. Prepare cost sheet for 2002 and 2003.

16

OR

5. A manufacturing company XYZ Ltd. sold 1000 units during the year 2006-07. Following are the figures related to the manufacturing and sale of product 'A' for the year 2006-07.

Sales Revenue 4,00,000/-	Profit 15,000/-
Direct Material 80,000/-	Direct Labor 1,20,000/-
Direct Expenses 10,000/-	Factory Overheads 50,000/-
Office Overheads 95,000/-	S&D overheads 30,000/-

For the next year i.e. 2007-08, it has been estimated that the production and sale will increase to 1200 units and projected costs are as follows,

Material cost 20% rise Wages 50% rise

Assuming the other costs will remain unchanged, prepare the statement showing price at which each unit should be sold so as to earn minimum profit of 10% on cost of sale.

16



6. Find out the total paper requirement in size 63.5 cms \times 91 cms for printing 20,000 copies of booklet in the size 210 mm \times 297 mm assuming that the booklet contains 24 pages and paper used is 80 GSM.

If the rate of the paper is Rs. 25/- per Kg. Find out the cost of the paper. **18**

OR

6. Find out the number of plates required to print the following job.

Text pages : 64 (Black and White)

Cover pages : 04 (Four color)

Size of book : Demi $\frac{1}{4}$

Size of machine available for printing : 23" \times 36"

Quantity to be printed : 3000.

18



[4063] – 296

**T.E. (Printing) Examination, 2011
OFFSET MACHINES – II
(2008 Pattern)**

Time : 3 Hours

Max. Marks : 100

Instructions : 1) *All questions are compulsory.*
2) *Answers to two Sections should be written in separate books.*

SECTION – 1

1. Explain the following : **16**
1) How does reel handling take place in web presses ?
2) Explain splice patterns.
OR
1. Explain the following : **16**
1) Y configuration Press
2) Satellite used for newspapers
3) Reasons of web breaks during splicing
4) Dancer roller.
2. 1) How anilox inking unit is more preferred in web offset ? **8**
2) Explain high speed dampening systems used in web offset. **8**
OR
2. 1) Minimum Cylinder Gaps in web offset. **16**
2) Cold set inks used in web offset.
3) Blanket cylinder clamping mechanism
4) Cylinder Packing and its importance.
3. Explain significance of chill rolls and its plumbing arrangement. **18**
OR
3. 1) Explain chopper folding mechanism and its use in commercial printing.
Assume necessary sizes. **9**
2) Explain maintenance of former folding mechanisms. **9**

P.T.O.



SECTION – 2

4. Explain the following terms w.r.t. web tension : **18**
- 1) Slip
 - 2) Modulus of elasticity
 - 3) Draw.

OR

4. Explain various tension zones in the web press. **18**
5. Explain remote console sheet cleaner, antistatic devices and chilled water recirculation used on web presses. **16**

OR

5. What is total preventive maintenance ? How is it useful for newspaper industry ? **16**
6. Explain following press troubles : **16**
- 1) Inadequate chilling of chill roll section
 - 2) Ink flying in press room
 - 3) Doubling
 - 4) TVI on press.

OR

6. Explain following paper problems : **16**
- 1) Web out of round
 - 2) Web tear
 - 3) Core damaged
 - 4) Loose Web.



[4063] – 35

T.E. (Production Engineering/Production Sandwich) (Semester – I)

Examination, 2011

METAL CUTTING AND TOOL DESIGN

(2003 Course)

Time : 3 Hours

Max. Marks : 100

Instructions : 1) Attempt one question of each Unit from Section – I and Section – II.

2) Answer 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

1. a) Prove that $\tan \beta = r \cos \alpha / (1 - \sin \alpha)$ where r -chip thickness ratio, α -rake angle on tool, β -shear plane angle. **5**
- b) While machining a steel rod on lathe following results were obtained width of cut = 2.5 mm, uncut chip thickness = 0.30, chip thickness = 0.8, rake angle on tool = 10 degree, cutting force = 1000N, feed force = 500N cutting speed of 25 m/min determine i) chip thickness ratio, ii) chip reduction coefficient, iii) shear plane angle, iv) coefficient of friction, v) velocity of chip along tool face. **10**
- c) Explain the procedure for force measurement in drilling operation. **5**

OR

P.T.O.



2. a) During machining of C-25 steel with 0-10-6-6-8-90-1 mm (ORS) shaped cutting tool, the following observations have been made.
- i) Depth of cut = 2.5 mm, ii) Feed = 0.20 mm/rev iii) Speed = 80 m/min,
iv) Tangential cutting force = 1200 N, v) Feed thrust force = 600 N,
vi) Chip thickness = 0.5 mm.
- Calculate i) Shear force, ii) Normal force at shear plane, iii) Friction force,
iv) Coefficient of friction, v) specific energy in cutting. **10**
- b) Explain effect of cutting speed, depth of cut, feed, depth of drilling hole on forces in drilling. **6**
- c) Draw sketches and state the conditions for formation of different chips. **4**

Unit – II

3. a) Draw the sketches of following cemented carbide tips as per ISO standards and show different elements - i) Tip style-C, ii) Tip style-D, iii) Tip style-E. **9**
- b) Draw the tool geometry along with a one tooth and label the important part of reamer. **6**

OR

4. a) What is tool signature ? Explain tool signature in ASA method. **7**
- b) Explain different tool material along with their specific application. **8**

Unit – III

5. a) Define machineability. Explain factors affecting on machineability. **7**
- b) Write a short note on – i) Tool life and its measurement, ii) cutting fluid. **8**

OR



6. a) Derive the expression for tool life for minimum cost of production. 8
- b) In a turning operation, it was observed that the tool life was 150 min when the cutting speed was 20 m/min. as the speed was increased to 25 m/min tool life dropped to 45 min. If the time required to change the tool was 2 min and if the cost of regrinding the tool was 10 times the cost of turning /min. calculate i) most economical cutting speed, ii) tool life for maximum production. 7

SECTION – II

Unit – IV

7. a) What are formed tools ? Explain design procedure for circular form tool. 8
- b) Explain the various design aspect of a single point tool. 7

OR

8. a) Mild steel jobs are to be reamed to obtain hole of 20 ± 0.3 mm, calculate the tolerances on the reamer and wear allowance, if the over size cut by the reamer varies from 5 to 10 microns and manufacturing tolerance extends up to 20 microns. Draw the sketch of tolerance zone for above reamer diameter and show the dimension on it. 7
- b) With neat sketch explain various elements of a key way broach. 8

Unit – V

9. a) Discuss the principle of perpendicular locating planes. 7
- b) Write a short note on – i) standardization of Jig and fixture, ii) selection of clamping devices. 8

OR

10. a) What are the locators ? Explain different types of locater. 8
- b) Explain the design considerations for bushes used in jig. 7



Unit – VI

11. Design a jig for drilling Φ 10 mm holes for a component shown in fig. no 1. **20**

OR

12. Design a milling fixture to face a Φ 20 mm at A and B for a component shown in fig. no 1. **20**

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.

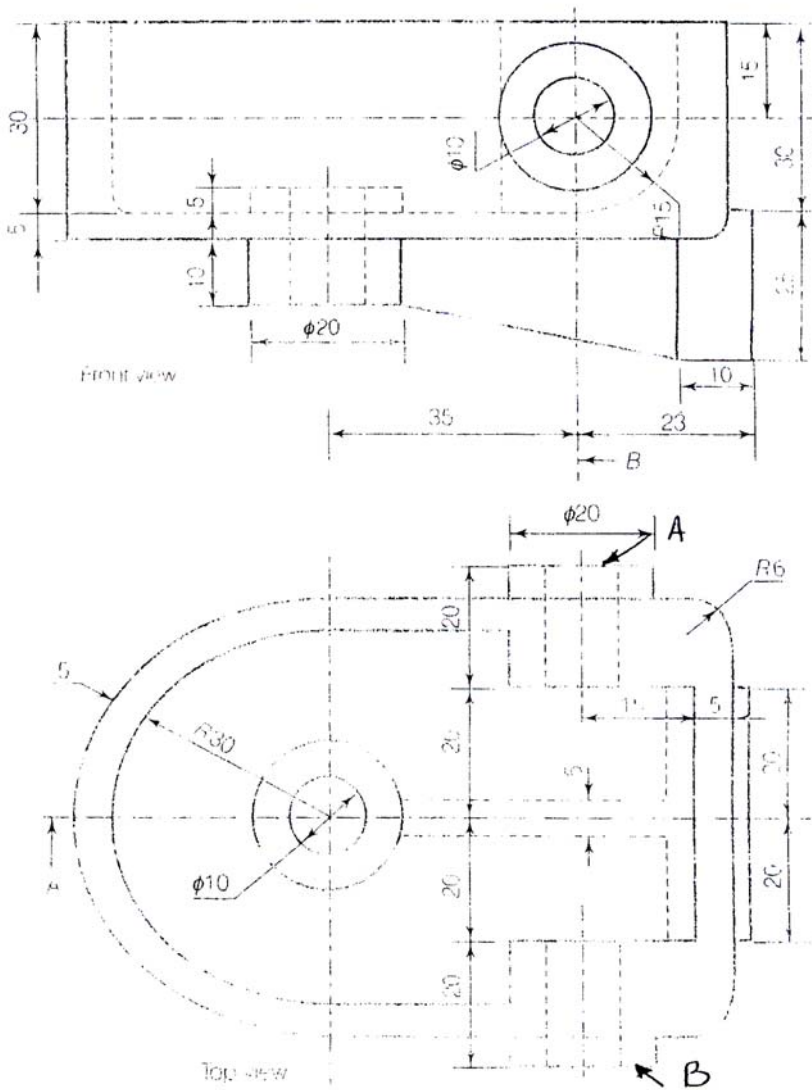


fig. no. 1



[4063] – 363

**T.E. (Biotechnology) Examination, 2011
HEAT TRANSFER
(2008 Pattern)**

Time : 3 Hours

Max. Marks : 100

- Instructions:** 1) Answer **three** questions from Section – I and **three** questions from Section – II.
2) Answer 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 of scientific calculator is **allowed**.
6) Figures to the **right** indicate **full** marks.

SECTION – I

1. a) State and explain 'Buckingham pi-theorem' 6
b) Using Buckingham pi-theorem find out the dimensionless groups involved in convection heat transfer coefficient for flow of fluid through a tube. 10

OR

2. a) Explain the modes of heat transfer with suitable example. 9
b) How is dimensional analysis helpful in data reduction and data analysis ? Explain with suitable example. 7

3. a) A furnace wall made up of steel plate 1 cm thick is lined on inside with silica brick 15 cm thick and on the outside with magnesite brick 15 cm thick. The temperature on the inside edge of the wall is 700 °C and on the outside is 15 °C. Find the quantity of heat passed in kcal per hour per m² and the temperature at the interface of the steel wall and the magnesite brick.

It is required to reduce the heat flow to 1000 kcal/hr m² by means of air gap between steel plate and magnesite brick. Estimate the width of this gap. Thermal conductivity in kcal/hr m °C are 14.5, 1.4, 4.5 and 0.029 respectively for steel, silica brick, magnesite brick and air. 10

- b) Liquid ammonia at – 20 °C is stored in a spherical vessel of inner and outer radii 1 m and 1.05 m, respectively. The inner shell of 3 cm thickness is made of nickel steel ($k = 19$ W/m K) and the outer shell of thickness 2 cm in made of carbon-steel ($k = 54$ W/m K). The vessel is exposed to atmospheric air at 30 °C. The inside and outside film coefficients are 100 W/m² K and 10 W/m² K, respectively. Calculate the rate of heat losses from liquid ammonia. 8

OR

P.T.O.



4. a) An ice box has walls constructed of a 10 cm layer of cork-board contained between two wooden walls, each 2 cm thick. Find the rate of heat removal in kcal per m² per hour if the inner wall surface is kept at – 10 °C, while the outer surface temperature is 30 °C. Find out the zone in the wall where the temperature is 20 °C. Thermal conductivities of cork-board and wood respectively are 0.035 and 0.09 kcal/hr m °C. **6**
- b) A long cylindrical nickel steel ($k = 19 \text{ W/m K}$) rod of 4 mm diameter is used as a heating element. By passing current through the rod heat is uniformly generated at the rate of 2 GW/m^3 . If the outer surface of the rod is maintained at 110 °C, calculate the maximum temperature at the centre of the rod. **2**
- c) What is critical thickness of insulation ? Derive the equation for critical thickness of insulation. **10**
5. a) Show that in absence of flow of fluid steady state differential equation of heat convection reduces to steady state differential equation of heat conduction. **6**
- b) Explain film wise and drop wise condensation in detail. **6**
- c) Explain the concept of thermal boundary layer. **4**

OR

6. a) Derive the equation for overall heat transfer coefficients in a hollow cylinder. **10**
- b) Write a note on 'Heat transfer in boiling liquids'. **6**

SECTION – II

7. a) Determine the net radiant heat exchange between two parallel oxidized iron plates, placed at a distance of 25 mm, having sides of 3 m × 3 m. The surface temperature of the two plates are 100 °C and 40 °C respectively. Emissivities of the plate are equal. $\epsilon_1 = \epsilon_2 = 0.736$ **6**
- b) Explain the phenomena of radiation between two bodies kept in an enclosure. **6**
- c) What is shape factor ? Explain with suitable example. **4**

OR

8. a) Explain various laws involved in radiation heat transfer. **10**
- b) Write a note on (i) diffuse reflection (ii) reciprocal relation. **6**
9. a) How the fouling takes place in heat exchanger ? Explain fouling factor. **4**
- b) Derive the equation of LMTD in parallel flow heat exchanger. **10**
- c) Explain the working of 1-2 shell and tube heat exchanger. **4**

OR



10. a) In a double pipe heat exchanger, oil flows through a 1.5 m long copper tube of 18 mm ID and 24 mm OD while water flows through the annulus. The convective heat transfer coefficient between the oil and the tube is $500 \text{ W/m}^2 \text{ K}$ and the convective heat transfer coefficient between the tube and water is $800 \text{ W/m}^2 \text{ K}$. Calculate the overall heat transfer coefficient based on the outside area of the pipe. **4**
- b) Define heat exchanger effectiveness. Give its significance and derive the equation for parallel flow double pipe heat exchanger considering cold fluid as the minimum fluid. **14**
11. a) Calculate the amount of steam required for concentrating the solution of caustic soda from 28% W of solids to 40% W of solids in a single effect evaporator. The feed rate is 25000 kg/h and its temperature is 60°C . The absolute pressure in the evaporator is 0.2 kg/cm^2 (boiling point 60°C). Saturated steam at 1.4 kg/cm^2 (108.7°C) is to be used as heating medium. The elevation in boiling point is 25°C . If the overall heat transfer coefficient is $670 \text{ kcal/hr m}^2 \text{ }^\circ \text{C}$, calculate the heating surface required. The enthalpy data for various streams are as follows :
- Vapor at $0.2 \text{ kg/cm}^2 = 623 \text{ kcal/kg}$
28% NaOH at $60^\circ \text{C} = 50 \text{ kcal/kg}$
40% NaOH at $85^\circ \text{C} = 90 \text{ kcal/kg}$
Latent heat of steam at $1.4 \text{ kg/cm}^2 = 534 \text{ kcal/kg}$ **10**
- b) State and explain (i) Boiling point elevation (ii) Duhring's rule (iii) Heat of dilution. **6**
- OR
12. a) Define capacity of an evaporator. How the feed temperature affects the evaporator capacity ? **4**
- b) Write the enthalpy balances for single effect evaporator. **6**
- c) Distinguish between (i) single effect evaporator and multiple effect evaporator (ii) feed forward and backward feeding methods. **6**



[4063] – 4

**T.E. Civil (Semester – I) Examination, 2011
(2003 Course)
GEOTECHNICAL ENGINEERING**

Time : 3 Hours

Max. Marks : 100

Instructions : 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) Black 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

1. a) With the help of three phase diagram define the terms : void ratio, degree of saturation, water content and porosity. **6**
- b) What are the various Index properties of soil ? Explain the significance of each. **6**
- c) The liquid limit and plastic limit of a soil are 75% and 33% respectively. What is plasticity index ? The void ratio of the soil on oven drying was found to be 0.63, what is the shrinkage limit. Assume $G = 2.7$. **6**

OR

2. a) Draw a plasticity chart and explain how the fine grained soils are classified with the help of plasticity chart. **6**
- b) What is Stokes law ? What are the limitations of stokes law ? **6**
- c) The grading curve of a soil gives the effective size as 0.16 mm, $D_{30} = 0.4$ mm and $D_{60} = 0.30$ mm. Find C_u and C_c . Classify the soil. **6**

P.T.O.



3. a) Explain with a diagram a method for determining coefficient of permeability (k) for clay soils in the laboratory. **6**
- b) What are the various factors that affect the permeability of soil ? **5**
- c) At the toe of a dam, the foundation soil has a void ratio of 0.72. The specific gravity of soil solids is 2.65. To ensure safety against piping, the upward gradient must not exceed 30% of the critical gradient at which quick sand condition occur. Estimate the maximum permissible upward gradient. **5**

OR

4. a) What is flow net ? What are the properties of flow net ? **5**
- b) Derive two-dimensional Laplace's equation for seepage from first principle. **6**
- c) In a falling head permeameter a soil sample 75 mm in diameter and 55 mm length was tested. At the commencement of the test, the initial head was 80 cm and after one hour, the head was 40 cm, find the coefficient of permeability, if the diameter of stand pipe is 1 cm. **5**
5. a) Compare standard proctor and modified proctor test. How would you decide the type of test to be conducted in the laboratory ? **6**
- b) What are the various assumptions in the Boussinesq's equation ? Write the Boussinesq's equation giving the meaning of each term. **5**
- c) Calculate the vertical stress at a point at a depth of 3 m directly under the centre of the circular area of radius 2 m and subjected to a load of 200 KN/m². **5**

OR

6. a) Explain the terms : Isobar, pressure bulb with suitable sketches. **5**
- b) Sketch the moisture-density relationship and show thereon the MDD, OMC, ZAV. **5**
- c) Assuming the following data, obtained from a compaction test, determine the MDD and OMC. **6**

Water content (%)	10.5	14.0	18.3	20.6	24.0	27.5
Bulk density (kg/m³)	1650	1760	1900	1980	1950	1850



SECTION – II

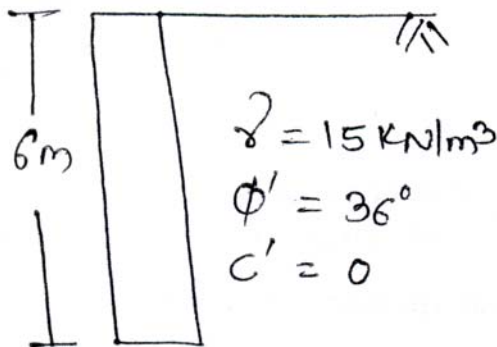
- 7. a) Explain in detail vane shear test. Derive the formula for shear strength of soil by using this test. 8
- b) Write Coulomb's equation. Draw graph of σ Vs τ for following soils : 6
 - 1) C – Soil
 - 2) C – ϕ Soil
 - 3) ϕ – Soil
- c) Write four advantages of Triaxial compression test. 4

OR

- 8. a) Explain typical stress-strain curve for clays and sand. 8
- b) Write a note on Liquefaction of Soil. 4
- c) Determine shear strength parameters of Soil by using following data of direct shear test. 6

Normal Stress (KN/m ²)	Shear Stress (KN/m ²)
85	140
95	160
105	175

- 9. a) Derive coefficient of active earth pressure 'Ka' by using Rankine's earth pressure theory. 8
- b) An 6 m high retaining wall is shown in following sketch. Determine the Rankine active force per unit length of the wall and the location of the resultant. 4



- c) Explain with sketch active and passive states due to wall movement. 4

OR



10. a) Explain with sketch graphical solution for Coulomb's Active Earth Pressure. **8**
- b) Write a note on following : **8**
- 1) Modes of failure of slopes
 - 2) Landslides.
11. a) Explain in detail following index properties of rocks : **4**
- 1) Porosity
 - 2) Density
- b) Write a note on : **8**
- 1) Modes of failure of rock
 - 2) Sonic velocity and Durability of rocks.
- c) Explain Rock classification by RMR method. **4**

OR

12. a) Explain in detail procedure for determination of shear strength of rocks. **8**
- b) Write a note on following : **8**
- 1) Goodman classification of rocks
 - 2) Geological classification of rocks.



[4063] – 54

T.E. Electrical (Semester – I) Examination, 2011
CONTROL SYSTEM – I
(2003 Course)

Time : 4 Hours

Max. Marks : 100

SECTION – I

1. a) State and explain the terms :

8

- i) Transfer function
- ii) Feedback
- iii) Order of a control system
- iv) Type of a control system.

b) Find the transfer function $G(S) = \frac{V(S)}{I(S)}$. Assume all initial condition as zero.

8



$$R_1 = 2\Omega, R_2 = 4\Omega, R_3 = 6\Omega, L_1 = 2H, C = 0.5 F$$

Fig. 1.b

OR

P.T.O.



2. a) State and explain Mason's gain formula. 6
- b) Apply Mason's Gain Formula to find $\frac{C}{R}$ in the figure 2b, below. 10

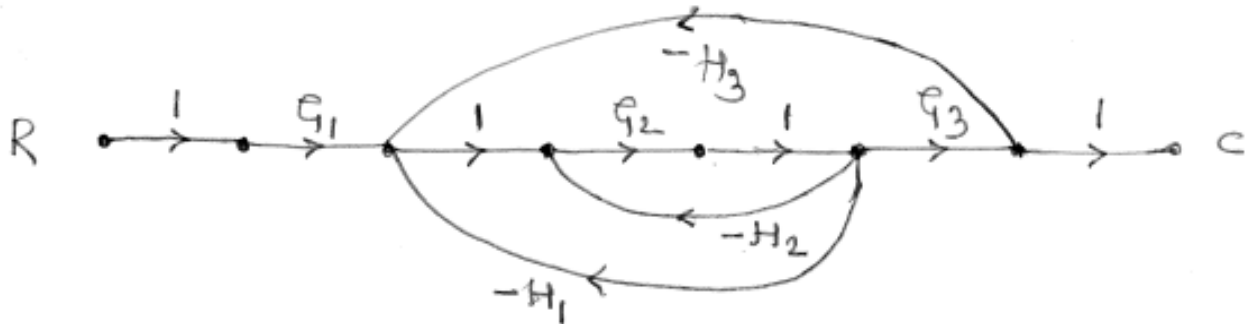


Fig. 2.b

3. a) Derive expressions for static error coefficients and steady state errors for type 1 and type 2 systems, if the inputs are step, ramp and parabolic type signals. 8
- b) Sketch the time response of second order control system for under damped case and hence, state and explain all the time response specifications. 8

OR

4. a) A unity feedback heat treatment system has open loop transfer functions. 6

$$G(S) = \frac{10000}{(1+S)(1+0.5S)(1+0.02S)}$$

The output set point is 500°C. What is the state temperature ?

- b) For a unity feedback system with $G(S) = \frac{125}{S(S+10)}$.

Find :

- i) Peak overshoot
- ii) Settling time for setp input
- iii) Steady state error for input $5u(t)$
- iv) Steady state error for input $5t^2u(t)$.

10



5. a) Discuss : i) System stability ii) Absolute stable system iii) Marginally stable system iv) Conditionally stable system v) Unstable system. **6**
- b) State and explain Routh-Hurwitz stability criterion. What are the limitations of this method ? **6**
- c) Test the system stability whose characteristic equation is : $S^3 + 5S^2 + 6S + 30 = 0$ **6**

OR

6. a) Explain procedural steps or rules to sketch the root locus for a given open loop transfer function. **8**
- b) Sketch the root locus for open loop system $G(S)H(S) = \frac{K}{S(S + 4)(S^2 + 2S + 2)}$. Find stability. **10**

SECTION – II

7. a) Compare frequency domain specifications with time domain specifications for a second order control system. **8**
- b) State and explain frequency domain specifications : **8**
- i) Gain margin and Phase Margin
 - ii) Resonant Peak
 - iii) Resonant frequency
 - iv) Band width (BW).

OR

8. a) Explain stability criterion for Bode Plot. Discuss i) Gain cross-over frequency ii) Phase cross over frequency. **6**
- b) Sketch the bode plot and determine the following : **10**
- i) GM
 - ii) PM
 - iii) W_{gc}
 - iv) W_{pc}

For the transfer function $G(S) = \frac{10}{S(1 + 0.4S)(1 + 0.1S)}$ and discuss stability.



9. a) Explain the concept of polar plots as their applications in control system. **4**
 b) Discuss how a polar plot is used to determine the stability of control system, given a open loop transfer function. **6**
 c) Sketch the polar plots for type 1 and type 2 systems. **6**

OR

10. a) State and explain Nyquist stability criterion. **4**
 b) Given $G(S) = \frac{1}{S(S+1)(S+2)}$. Draw the Nyquist plot and test the stability. **12**
 Find W_{pc} , W_{gc} , PM and GM.

11. a) Sketch and explain compensation networks for lead and lag compensation. **8**
 b) Explain the design procedure for lead compensation using i) Root locus
 ii) Bode plot. **10**

OR

12. For a unity feed back system $G(S) = \frac{K}{S(S+1)(1+0.5S)}$ design compensation transfer function to have
 i) Velocity error constant $k_v = 5 \text{ sec}^{-1}$
 ii) PM not greater than 40°
 iii) GM not greater than 10 dB. **18**
-



[4063] – 69

T.E. E&TC/Electronics Indl.Elex. (Semester – II) Examination, 2011
ELECTROMAGNETIC WAVES AND RADIATING SYSTEMS
(2003 Course)

Time : 3 Hours

Max. Marks : 100

- Instructions :* 1) Answer 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) Answer 3 questions from Section I and 3 questions from Section II.
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

1. a) State and prove Gauss law. 8
b) Derive the boundary conditions for electric field at an interface between conductor and free space. Also derive magnetic boundary conditions. 10

OR

2. a) Define electric field intensity and electric flux density. Derive the expression for \bar{E} using Coulomb's law of force. 8
b) What is Laplace equation ? Derive the expression for parallel plate capacitor using Laplace's equation. 10
3. a) What is Poynting vector ? What is its significance ? Derive the expression for paynting vector ? 8
b) If the electric field \bar{E} of an electromagnetic wave in free space is given by

$$\bar{E} = 2 \cos w \left(t - \frac{z}{c} \right) \hat{y} \text{ v/m. Find the magnetic field } \bar{H}. \quad \text{8}$$

OR

P.T.O.



4. a) What are phasors ? What is their significance ? **6**
- b) In a non-magnetic material ($\epsilon_r \neq 0, \mu = \mu_0, \sigma = 0$)
- Find \bar{E} using Maxwell equations
 - Find Poynting vector
 - Find the time average power crossing the surface are
 $x = 1; 0 < y < 2; 0 < z < 3\text{m}$ given $\bar{H} = 30 \cos(2\pi \times 10^8 t - 6x)\hat{y}$ mA / m. **10**

5. a) What is uniform plane wave ? What is meant by transverse electromagnetic wave ? **8**
- b) An \bar{H} field in free space is given $H(x, t) = 10\cos(10^8 t - \beta x)\hat{y}$ A / m. Find
 a) β b) λ c) $E(x, t)$ at $P(0.1, 0.2, 0.3)$ at $t = 1$ ns. **8**

OR

6. a) Define and explain in detail :
- Velocity of propagation
 - Wave impedance
 - Depth of penetration
 - Group velocity. **8**
- b) When the wave is propagating in a good conductor, obtain the expression for α, β and what do you understand from skin depth, write the expression and physical significance for skin depth ? **8**

SECTION – II

7. a) A transmission line has series inductance of 0.56 mH and capacitance of 0.1 μF per km. If the losses due to conductor resistance and insulation leakage are negligible. Calculate :
- Characteristic impedance
 - Phase velocity. **8**
- b) What is single stub matching ? Explain the merits and demerits of single stub matching. **8**

OR



8. a) What is reflection on transmission line ? What are disadvantages of the same ? Explain in brief the terms : reflection coefficient and SWR. **8**
- b) The open and short circuit impedance of a certain open wire transmission line of 40 km length at 800 Hz are $z_{oc} = 328 L - 29.2^\circ \Omega$ and $z_{sc} = 1600 L - 6.8^\circ \Omega$. Calculate values of $z_0, \alpha, \beta, R, L, G$ and C . **8**
9. a) Calculate the dimensions of a half wave dipole antenna operating at 100MHz in the free space. What is its radiation resistance ? Give the total power radiated if it is fed with a current of amplitude 25A. **6**
- b) Explain the following terms related to antenna
- 1) Radiation resistance
 - 2) Directivity
 - 3) Field radiation pattern
 - 4) Power radiation pattern
 - 5) Directive gain. **10**

OR

10. a) Explain the following : **10**
- i) Antenna polarization
 - ii) Antenna feeding techniques.
- b) A dipole carries RMS current of 100A at 150 MHz. Its length is 1m. Calculate
- i) Power radiated by antenna
 - ii) Effective height of antenna
 - iii) Directive gain of antenna. **6**



11. a) Explain the construction and working of a Yagi uda antenna with a neat sketch. **8**
- b) Sketch the normalized field pattern for a 4-element uniform linear array to have its maximum radiation directed normal to the axis of the array. Assume that the elements are isotropic and spacing to be $\frac{\lambda}{2}$. **10**

OR

12. a) Write short note on :
- i) Microstrip Antenna
 - ii) Slot Antenna. **10**
- b) Explain helical antenna with diagram. **4**
- c) A 10 element broadside array of isotropic radiators is to have directivity of 7 dB. What is the minimum element spacing that achieves directivity ? **4**
-



[4063] – 73

T.E. (Instrumentation & Control) (Semester – I) Examination, 2011
CONTROL SYSTEM COMPONENTS
(2003 Course)

Duration : 3 Hours

Total Marks : 100

Instructions : 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) **Black** 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

1. a) Derive the torque equation of the D.C. motor. **8**
- b) A 4 pole D.C. motor has lap connected armature winding with 576 conductors and it draws an armature current of 25A. If flux per pole is 0.012 Weber, calculate gross torque developed by the motor. **6**
- c) Explain why single phase induction motor do not have starting torque ? How they can be made self starting (any one method) ? **4**

OR

2. a) How direction of 3 phase induction motor be reversed ? Develop an electrical wiring diagram for the same using standard electrical logic symbols. **10**
- b) Compare squirrel cage induction motor with slip ring induction motor with respect to construction, performance and application. **8**

P.T.O.



3. a) Explain the following terms in relation to stepper motor. **8**
i) Maximum Pull torque ii) Slew Range
iii) Holding Torque iv) Detent Torque
- b) List various types of stepper motor. Explain with neat sketch working of any one type. Give its 2 application. **8**

OR

4. a) Explain the various losses taking place in a dc generator (min 4 losses). **8**
b) Draw and explain the characteristics of dc shunt and dc series generator. Describe any two applications of each on the basis of characteristics. **8**
5. a) Explain with neat sketch the working of reed relay and give its 2 application. **8**
b) Give any 2 application of the following types of switches :
i) Thumbwheel switch, ii) Limit switch
iii) DIP switch, iv) Selector switch **8**

OR

6. a) Compare contactor with relay (Diagram and 4 points). **8**
b) Draw, explain and also give the 4 specifications of the following switches : **8**
i) Toggle switch
ii) Temperature switch.

SECTION – II

7. a) What is meant by an interlock ? Explain its necessity by giving 2 examples. **10**
b) Draw using standard symbols electrical wiring diagram for Direct online starter. **8**

OR

8. a) Explain use of MCC. Draw using standard symbols any two electrical wiring diagrams related to MCC. **10**
b) State the importance of electric braking. Explain any 1 method used for DC shunt motor braking. **8**



9. a) Explain the Pneumatic Power supply with neat sketch. **8**
- b) Develop Pneumatic System for Job Sorting Process. Draw necessary sketch and various operations involved in it. **8**

OR

10. a) What is cushioning of air cylinder ? List 4 types of cushioning. State its effect on the cylinder performance. **8**
- b) Draw and write short notes on : **8**
- i) Pneumatic Time delay valve
 - ii) Air Filter Regulator

11. a) Explain Meter-in and Meter-out control in details. **8**
- b) Give the classification of hydraulic pumps (any 4 point). Explain the working of any one type. **8**

OR

12. a) Explain Hydraulic power supply in detail with neat sketch. **8**
- b) Compare hydraulic systems with pneumatic system based on the following : **8**
- i) Power developed
 - ii) Installation and running cost
 - iii) Maintenance
 - iv) Application.



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**T.E. Instrumentation and Control (Semester – II) Examination, 2011
PROCESS PLANT OPERATION (2003 Course)**

Time : 3 Hours

Max. Marks : 100

- Instructions :** 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) **Black figures** to the **right** indicate **full** marks.
5) Assume suitable data, if **necessary**.

SECTION – I

1. Explain positive displacement pump, centrifugal pump and absorption in detail. **16**

OR

2. Define unit process and unit operation and explain them with any industrial application. **16**
3. Explain the different types of reactors with reference to their performance equation. **16**

OR

4. Explain the role of kinetics of chemical reaction in designing of reactor. **16**
5. Explain the term energy balance and material balance with suitable example. **18**

OR

6. Write short notes on : **18**
- 1) Heat exchanger
 - 2) Evaporators
 - 3) Mass transfer.

P.T.O.



SECTION – II

7. Explain various types of screening and crushers in detail. **16**
- OR
8. Explain the terms hydrocyclone and flotation in detail. **16**
9. Explain different types of techniques used in hardness testing. **16**
- OR
10. Write notes on : **16**
- 1) Heat treatments on metal
 - 2) Corrosion and its protection techniques.
11. Draw and explain the manufacturing of sugar with flow sheet. **18**
- OR
12. Explain the term NPK in fertilizer. Draw and explain the manufacturing of urea with process flow sheet. **18**



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**T.E. Printing (Semester – I) (2003 Course) Examination, 2011
TECHNOLOGY OF PRINT FINISHING AND PACKAGING**

Time : 3 Hours

Max. Marks : 100

SECTION – I

1. Explain basic finishing operations. **18**

OR

1. Discuss working of a inline print finishing machine. **18**

2. Write short notes on **(any 2)** :

1) Collating marks

2) Signatures

3) Adhesives.

16

OR

2. Discuss in detail pre-forwarding operations. **16**

3. Explain in detail :

1) blind emboss

2) lamination.

16

OR

3. Explain costs involved in finishing operations. **16**

P.T.O.



SECTION – II

4. Explain raw materials for corrugation packaging in detail. **16**
- OR
4. Explain manufacturing process of a 5 ply corrugated carton. **16**
5. Explain 3 paper testing methods in detail. **18**
- OR
5. Explain problems in printing duplex boards for packaging. **18**
6. Explain machinery involved in corrugated carton manufacture. **16**
- OR
6. Explain sustainability concept in environmental view. **16**



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T.E. Printing (Semester – II) Examination, 2011
SURFACE PREPARATION – I
(2003 Course)

Time : 3 Hours

Max. Marks : 100

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

SECTION – 1

1. Explain any four factors affecting the planning of the job. **16**

OR

1. Explain the Sheet work and Half Sheet work method with appropriate diagrams. **16**

2. Explain the manufacturing process of Water Deep etch plate in brief. **16**

OR

2. Explain the manufacturing process of Positive working PS plate in brief. **16**

3. Explain the method of preparing the Direct Electrophotostatic plate in brief with suitable diagram. **18**

OR

3. Explain the method of preparing the Indirect Electrophotostatic plate in brief with suitable diagram. **18**

SECTION – 2

4. Explain the Thermal Ctp technology in detail with diagram. **16**

OR

4. Explain the Silver Halide Ctp technology in brief with diagram. **16**

P.T.O.



5. Explain the indirect method of preparing the screen with suitable diagrams. **16**

OR

5. Explain the Direct Indirect method of preparing the screen with suitable diagrams. **16**

6. Find out number of plates required to print the following job and also give the printing plan for the same : Annual Report

Text pages – B/W – 64

Cover pages – four color – 04

Size of the book – demy 1/4

Size of the machine – 23" × 36"

Quantity to be printed – 3000 copies **18**

OR

6. Explain any four elements of UGRA PCW in detail. **18**



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T.E. (Printing) (Semester – II) Examination, 2011
OFFSET MACHINES – I
(2003 Course)

Time : 3 Hours

Max. Marks : 100

Instructions : 1) All questions are compulsory.
2) Answers to two Sections should be written in separate books.

SECTION – I

1. Explain the following.

- | | |
|---|---|
| 1) How does the lithographic plate work on offset machine ? | 5 |
| 2) Explain plate clamping mechanism. | 8 |
| 3) Explain packing requirements in offset. | 3 |

OR

- | | |
|--|----|
| 1. Explain automatic plate loading system. | 16 |
| 2. Explain : | |
| 1) Roller materials in inking unit. | 8 |
| 2) Ink duct and ink keys setting. | 8 |

OR

- | | |
|--|----|
| 2. Explain drum type inking system in offset with neat figure and ink path. | 16 |
| 3. Explain the purpose of fountain solution in offset and state various reasons to maintain pH and conductivity. | 18 |

OR

- | | |
|---|---|
| 3. 1) Explain modern dampening system construction and use. | 9 |
| 2) List down various constituents of fountain solution. | 9 |

P.T.O.



SECTION – II

4. Write short notes on : **16**
- 1) Blowers and suckers
 - 2) Forwarding roller
 - 3) Double sheet detector
 - 4) Grippers in delivery system.

OR

4. What is front lay system ? Explain with neat diagram. **16**
5. Explain pre makeready and makeready of a 2 colour press for a 2 colour job. **16**

OR

5. Explain problems related to machine : **16**
- 1) Picking
 - 2) Circumferential slur
 - 3) Ghosting
 - 4) Doubling.
6. 1) State the plan of daily Press Maintenance of delivery unit of single color machine. Write a check list. **9**
- 2) Explain any four types of waste generated in press room. **9**

OR

6. Explain ink waste control and paper waste control in press room. **18**



[4063] – 97

**T.E. (Chemical Engineering) (Semester – II) Examination, 2011
(2003 Course)**

TRANSPORT PHENOMENA

Time : 3 Hours

Max. Marks : 100

- Instructions :** 1) Answers to the **two** Sections should be written in **separate** books.
2) **Neat** diagrams must be drawn **wherever** necessary.
3) **Black 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

1. a) Explain time independent fluids and time dependent fluids. **6**
b) Derive Newtons law of viscosity. **6**
c) Compute the mean molecular velocity \bar{u} cm Sec⁻¹, and the mean free path λ cm in O₂ at 1 atm and 273.2 °K. Assume $d = 3.0$ °A. What is the ratio of mean free path to the molecular diameter in this situation. **6**

OR

2. a) Derive the velocity profile and momentum profile for a Newtonian fluid through a circular pipe inclined at angle β . Find the ratio of maximum velocity to average velocity. **12**
b) What is the science of rheology. **6**
3. a) A small capillary tube with an inside diameter of 2.2×10^{-3} m and length of 0.317 m is being continuously used to measure the flow rate of liquid having density of 990 kg/m³ and $\mu = 1.13 \times 10^{-3}$ Pa.Sec. The velocity of liquid is 0.275 m/Sec. Calculate pressure drop. **6**

P.T.O.



- b) Derive the equation for steady state viscous flow in a horizontal tube of radius r_0 , where the fluid is far from the tube inlet. The fluid is incompressible and μ is constant. The flow is driven in one direction by a constant pressure gradient. 10

OR

4. a) Discuss friction factors for packed columns. 6
 b) State and explain the overall energy balance for a steady-state flow system. 5
 c) What is macroscopic balance. 5
5. a) Compare momentum and energy transport. 8
 b) A plastic panel of area $A = 929 \text{ cm}^2$ and thickness $Y = 0.64 \text{ cm}$ was found to conduct heat at a rate of 3.0 W at steady state with temperature of $T_0 = 24^\circ\text{C}$ and $T_1 = 26^\circ\text{C}$ on the two main surfaces. What is thermal conductivity of plastic at 25°C ? 8

OR

6. a) Deduce the relation for temperature distribution and efficiency of straight rectangular fin of uniform cross section. 10
 b) A copper wire has a radius of 2 mm and a length of 5 m . For what voltage drop would the temperature rise at the wire axis be 10°C , if the surface temperature of the wire is 20°C . 6

SECTION – II

7. a) A standard schedule 40, two inch steel pipe (inside diameter 2.067 in. and wall thickness of 0.154 in.) carrying steam is lagged with 2 in. of 85% magnesia covered in turn with 2 in. of cork. Estimate the heat loss per hour per foot of pipe if the inner surface of the cork is at 250°F and outer surface of the cork at 90°F . The thermal conductivity of the substances concerned are
 Steel = 26.1 Btu/hr.ft.F , 85% magnesia = 0.04 Btu/hr.ft.F
 Cork = 0.03 Btu/hr.ft.F . 8
- b) Give the physical significance of Brinkman number and explain when will the temperature become maximum. 8

OR



8. a) Discuss semi-empirical expressions for turbulent energy flux. **8**
b) Derive the expression for temperature distribution for nuclear heat source stored at the centre in a spherical shell. Where will the temperature be maximum. **8**
9. a) Discuss the theory of ordinary diffusion in gases at low density. **8**
b) Estimate diffusivity for acetic acid in dilute aqueous solution at 12.5°C. The density of acetic acid at its normal boiling point is 0.937 gm cm⁻³
 $\psi_B = 2.6$, $M_B = 18.02$, $\mu = 1.22 C_p$. **8**

OR

10. a) Derive equation of molar flux for diffusion with heterogeneous chemical reaction. **8**
b) The value of DAB for dilute solution of methanol in water at 15°C is 1.28×10^{-5} cm²/s. Calculate DAB for the same solution at 100°C
Data : μ_1 at 15°C = 1.14 C_p
 μ_2 at 100°C = 0.284 C_p **8**
11. a) Write analogies among mass, heat and momentum transfer. **6**
b) Explain diffusion in laminar falling film. **6**
c) State common boundary conditions for diffusion problems. **6**

OR

12. Write note on :
a) Chilton and Colburn τ -factor analogy. **6**
b) Co-relation of binary mass transfer coefficients in one phase at low mass transfer rates. **6**
c) Physical significance of flux ratio. **6**



[4063] – 1

T.E. (Semester – I) Civil (2003 Course) Examination, 2011
THEORY OF STRUCTURES – II

Time : 3 Hours

Max. Marks : 100

- Instructions :**
- 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) **Black** 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) Solve **Q. 1** or **2**, **Q. 3** or **4**, **Q. 5** or **6**, from **Section I**, **Q. 7** or **8**, **Q. 9** or **10**, **Q. 11** or **12** from **Section II**.

SECTION – I

1. a) If AB is the intermediate span of the continuous beam. If beam AB is subjected to some arbitrary loading and if support 'B' sinks down by ' δ ', derive the slope deflection equations for this beam. Explain the meaning of each notation that you use in the equations. **8**
- b) Using Moment Distribution Method, plot BMD and SFD for 8m long beam, AB fixed at both end. A beam is subjected to udl, 50 kN/m over total span, AB. The cross section of beam changes at intermediate point 'O' such that flexural rigidity for AO = EI, for OB = 2EI. Length of AO = OB = 4m. **10**

OR

2. a) Compare sway and non sway frame. Show that carry over factor is half (i.e. 1/2) **8**
- b) Using Slope Deflection method, determine the support moments and reactions for the beam ABC if support B sink down by 50 mm. Beam is loaded and supported as narrated below. Supports A is fixed and support B and C are vertical roller.
Span AB = twice of span BC = 5 m. Downward udl on span AB = 50 kN/m,
Downward Concentrated load of 100kN at the centre of span BC.
EI = 0.21333 kNm, constant for span AB and BC. **10**
3. a) Derive flexibility coefficient matrix for the horizontal cantilever beam. A beam with span of 10m and uniform cross section is subjected to vertically downward point loads, A_1 at the center and A_2 at free end of cantilever beam. **8**

P.T.O.



- b) Derive the stiffness matrix and write the equilibrium equations for the frame loaded and supported as shown in **fig. 1**.

8

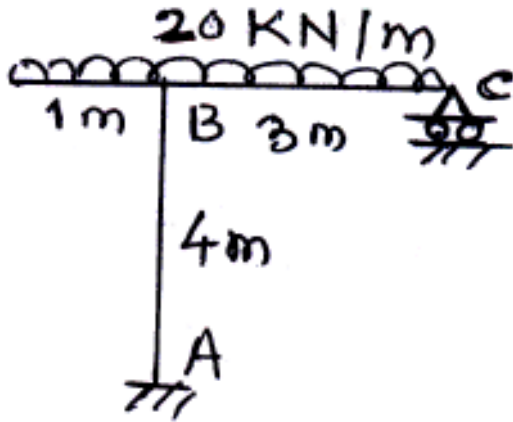


Figure 1

OR

4. a) Derive the flexibility matrix and write the displacement equations for the frame loaded and supported as shown in **fig. 1**.

8

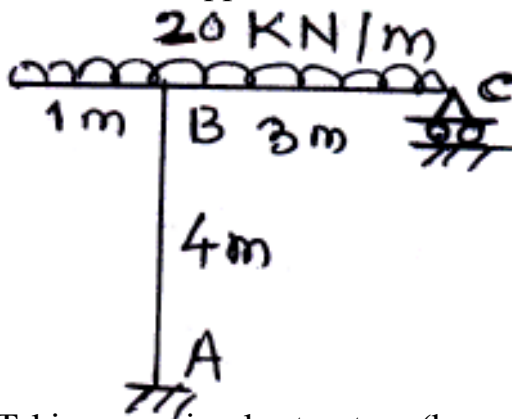


Figure 1

- b) Taking any simple structure (beam or frame), prove that product of stiffness matrix and flexibility matrix is unity.
5. a) A rigid jointed 2 bay-2 story frames is shown in **fig. 2**. Using Cantilever method, find the support moment and support reaction if Area of column ABC = A and Area of column DEF and GHI = 2A.

8

8

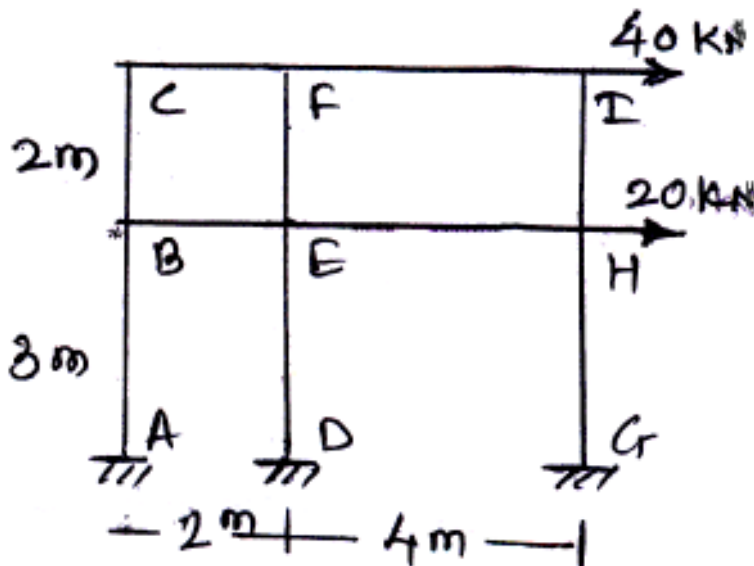


Figure 2



- b) A semicircular continuous beam ABC, curved in the plan with radius, 5m is supported at three equidistant supports and loaded with udl of 20 kN/m over full beam. Determine support moments, reactions and plot BMD and SFD. 8

OR

6. a) A rigid jointed 2 bay-2 story frames is shown in the **fig. 2**. Using portal method, find the support moment and support reaction if Area of column ABC = A and Area of column DEF and GHI = 2A. 8

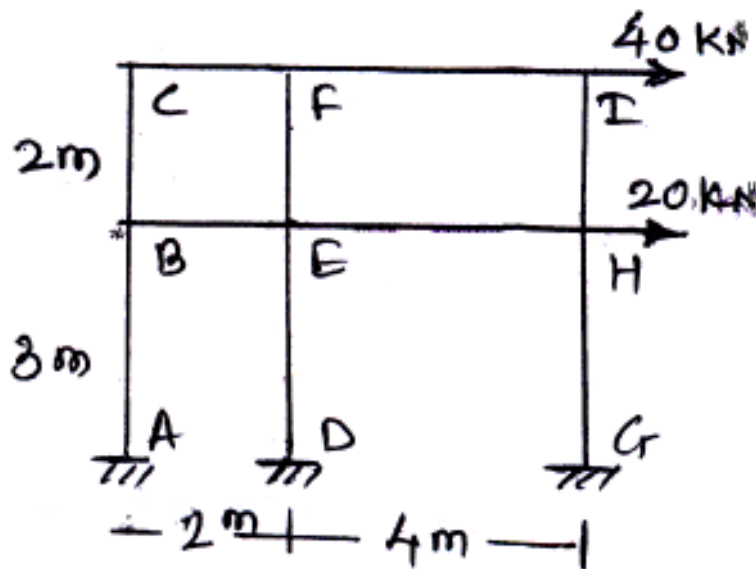


Figure 2

- b) A quarter circular beam, AB, curved in plan has a radius R is fixed at one end A and free at other end B and subjected to udl, 'w' per meter length. Derive the expression for BM and SF at the support of this beam and hence draw BMD and SFD. 8

SECTION – II

7. a) What is Airy's stress function ? 9
Check whether, $\phi = A(2y^4 - 6x^2y^2)$ represents the Airy's stress function.
- b) Explain the following : 9
- 1) Lateral instability of beam with example
 - 2) Utility of southwell plots.

OR

8. a) An elastic body under the action of external forces has following displacement field, $D = (2x^2 + y^2) i + (5z - y) j + (3x + y^2) k$. 9
Evaluate the components of strain at point (3, 1, 2)



- b) Derive the Beam-Column differential equation in stability analysis. State the form of solution of this equation. State the meaning of symbol that you use. 9
9. a) Determine the Shape Factor for the solid square cross section of size 4 m whose adjacent two sides are inclined at 45 degree with horizontal axis. 8
- b) Derive the expressions for length of cable with dip (h), span, (l) and self weight, w/m run. 8
- OR
10. a) Determine the plastic moment at collapse for a continuous beam ABC, loaded with ultimate load and supported as mentioned below with constant plastic moment, (M_p). 8
Support A is fixed and B and C vertical roller. Length AB = BC = 5m.
Span AB is subjected to udl, 50 kN/m and span BC is subjected to central point load, 100 KN.
- b) A uniform cable of weight w/m run connects two points which are at the same level. Treating the central dip, h very small as compared to span, L, prove that difference between maximum and minimum tension in the cable is w.h. 8
11. a) Using finite difference method, determine the displacement at the quarter span of simple supported beam AB of span 4 m subjected to central point load of 100 kN. Assume 1 m interval and constant EI for beam AB. 8
- b) Explain following : 8
- i) Development of finite element method
 - ii) Pascal's triangle
 - iii) Shape functions.
- OR
12. a) Using finite difference method, determine the displacement at the quarter span of fixed beam, AB of span 4 m subjected to central point load of 100 kN. Assume 1 m interval and constant EI for beam AB. 8
- b) State the following : 8
- i) Principal of virtual work
 - ii) Typical finite elements
 - iii) Convergence requirement for displacement function.



[4063] – 10

T.E. (Civil) (Semester – II) Examination, 2011
TRANSPORTATION ENGINEERING – I
(2003 Course)

Time : 3 Hours

Max. Marks : 100

- Instructions :** 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) Answer 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

1. a) Draw a typical cross section of a permanent way and show various parts. Also state the various requirements of a good track. **6**
- b) Compare railway transportation with road transportation and mention characteristics of Railway transportation. **6**
- c) What is gauge ? Why uniformity in gauge is desirable ? **4**

OR

2. a) Explain the advantages of Flat Footed rails over other types of rails with a neat sketch. **6**
- b) Enlist different types of sleepers used in Indian Railways. **6**
- c) Explain remedies of creep. **4**

P.T.O.



3. a) Explain : SWR, LWR and CWR. **6**
- b) If a 8° curve track diverges from a main curve of 5° in an opposite direction in the layout of a B.G. yard. Calculate the superelevation and the speed on the branch line, if the maximum speed permitted on the main line is 45 Kmph. **6**
- c) Explain the overriding and under cut. **4**

OR

4. a) Differentiate between under cut and over riding switches with a sketch. **6**
- b) Explain with sketch superelevation and negative superelevation. State the maximum permissible value for cant and cant deficiency. **6**
- c) Describe various types of gradients. **4**
5. a) Enumerate various methods of plate laying and explain any one method. **6**
- b) Differentiate between buffer stop and scotch block. **6**
- c) Write short notes on : **6**
- i) Sky bus
- ii) Metro rails.

OR

6. Write short note on : **18**
- i) Outer and home signals.
- ii) Directed Track Maintenance (D. T. M.).
- iii) Ballast profile for high speed track.
- iv) Point indicator.



SECTION – II

7. a) Compare the advantages and disadvantages of Tunnels with open cuts in the tabular form only. **6**
- b) Briefly describe how would you transfer the center-line of a proposed tunnel from the ground surface to inside of the tunnel. **6**
- c) Explain construction of tunnel by Heading and Benching method. **4**

OR

8. a) What are twin tunnels ? What are their advantages ? **6**
- b) Mention the sequence of operations for tunneling in rock. **6**
- c) Write a short note on horse shoe shape tunnel. **4**
9. a) What is mucking ? Describe the various mucking facilities in tunnels. **6**
- b) Explain concept of drilling pattern. **6**
- c) State and explain the objects in providing lining to tunnel interior. **4**

OR

10. Write short note on : **16**
- i) TBM
- ii) Gross hopper method for mucking
- iii) Dangers and preventive methods to control dust hazard
- iv) Safety precautions to be taken while tunneling through soft rock.



11. Draw neat labelled sketches to explain (**any four**)

18

- i) Marine Railway
- ii) Fenders
- iii) Quadripods
- iv) Floating dock
- v) Jetty.

OR

12. Writ short note on the following :

18

- i) Break water
- ii) Military harbour
- iii) Dolphins
- iv) Slipway.



[4063] – 100

**T.E. (Chemical Engineering) (Semester – II) Examination, 2011
INDUSTRIAL ORGANISATION AND MANAGEMENT (2003 Course)
(Common to Biotechnology)**

Time: 3 Hours

Max. Marks : 100

- Instructions :** 1) Answer **three** questions from Section I and Section II.
2) Answers to the Sections should be written in **separate** books.
3) **Neat** diagrams must be drawn **wherever** necessary.

SECTION – I

Unit – I

1. A) Explain following functions of management-Planning, Directing. **8**
B) Explain with neat sketch line and staff organization along with merit and demerits. **8**

OR

2. A) In development of scientific management give the significant contribution of F.W.Taylor. **8**
B) Explain i) Authority and responsibility, ii) Unity of command, iii) Scalar chain. **8**

Unit – II

3. A) Explain the significant role of trade unions in the development of chemical industries. **8**
B) Explain the following i) job analysis, ii) job evaluation. **8**

OR

4. A) What is meant by man power planning ? Enlist the various objective and benefits of man power planning. **8**
B) What is performance appraisal ? Explain in detail. **8**

P.T.O.

**Unit – III**

5. A) Explain tenders along with its types. And provides general format for quotations. **9**

B) What are the store records ? Explain bin cards and store ledger accounts. **9**

OR

6. A) For effective store keeping enlist main functions of store keeper. **9**

B) Explain inventory control along with functions and advantages. **9**

SECTION – II**Unit – IV**

7. A) What are the market research technique for effective marketing ? **8**

B) What is pricing ? Explain skimming and penetration pricing. **8**

OR

8. A) What is sale promotion ? Give various sale promotion techniques. **8**

B) Distinguish between selling and marketing. **8**

Unit – V

9. A) Explain import procedure involved in international trade. **8**

B) Explain role of Quality circle (QC) to improve productivity of chemical industries. **8**

OR

10. A) Explain the following i) custom or basic duty, ii) Antidumping duty. **8**

B) Explain the role of international trade in supporting Indian economy. **8**



Unit – VI

11. A) Explain Contract Act and enlist the essential elements for valid contract. **9**

B) Explain in detail Monopolies and Restrictive Trade Practice Act, 1969. **9**

OR

12. Write notes on following : **18**

1) Work study

2) Flow Process Chart

3) String Diagram.



T.E. (Petroleum Engg.) (Semester – I) Examination, 2011
MATHEMATICAL METHODS FOR PETROLEUM ENGINEERING
(2003 Course)

Time : 3 Hours

Marks : 100

- N.B. :**
- 1) In Section I attempt Qu. 1 or Qu. 2, Qu. 3 or Qu. 4, Qu. 5 or Qu. 6. In Section II attempt Qu. 7 or Qu. 8, Qu. 9 or Qu. 10, Qu. 11 or Qu. 12.
 - 2) Answers to the **two** Sections should be written in **separate** books.
 - 3) Neat diagrams must be drawn **wherever** necessary.
 - 4) Black figures to the **right** indicate **full** marks.
 - 5) Use of electronic pocket calculator is **allowed**.
 - 6) Assume suitable data, if necessary.

SECTION – I

1. a) If $u = e^x \cos y$, find v such that $f(z) = u + iv$ is analytic. Find $f(z)$ in terms of z . 5
- b) If $f(z)$ is analytic, show that
$$\left(\frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2} \right) |f(z)|^2 = 4|f'(z)|^2. \quad 6$$
- c) Find the bilinear transformation which maps the points $z = 1, i, 2i$ on the points $w = -2i, 0, 1$ respectively. 5

OR

2. a) A function $f(z)$ is defined as 6

$$f(z) = \frac{x^3(1+i) - y^3(1-i)}{x^2 + y^2} \quad z \neq 0$$
$$= 0 \quad z = 0$$

Show that C.R. equations are satisfied at origin but still the function is not analytic there.

P.T.O.



b) Show that function $f(z)$ with constant modulus is constant. 4

c) Show that, under the transformation $w = \frac{i-z}{i+z}$, x-axis in z-plane is mapped on to the circle $|w|=1$. 6

3. a) Use cauchy-integral formula to evaluate

$$\oint_C \frac{2z^2 + z + 5}{\left(z - \frac{3}{2}\right)^2} dz \text{ where 'C' is the ellipse } \frac{x^2}{4} + \frac{y^2}{9} = 1. \quad 6$$

b) Find residues at each of the poles of

i) $\frac{1}{z^2 + 1}$

ii) Cotz which lie within the circle $|z|=4$. 6

c) Evaluate using Residue theorem

$$\oint_C \frac{\sin \pi z^2 + 2z}{(z-1)^2(z-2)} dz \text{ where C is the circle } |z|=4. \quad 5$$

OR

4. a) Evaluate $\oint_C \frac{z^2 + 1}{z - 2} dz$ where C is the circle

i) $|z-2|=1$ and ii) $|z|=1$. 6



b) Find residues at each of the poles of the function

$$f(z) = \frac{z^2 + 2z}{(z + 1)^3 (z^2 - 9)}. \quad 5$$

c) Evaluate by contour integration

$$\int_0^{2\pi} \frac{\cos^2 3\theta}{5 - 4 \cos 2\theta} d\theta. \quad 6$$

5. a) Find coefficient of correlation for the following data.

x	20	22	23	25	25	28	29	30	30
y	18	20	22	24	21	26	26	25	27

and find the regression line of y on x. 8

b) A can hit the target 1 out of 4 times, B can hit the target 2 out of 3 times, C can hit the target 3 out of 4 times. Find the probability of at least two hit the target, when they fire simultaneously. 5

c) An unbiased coin is thrown 10 times. Find the probability of getting exactly 6 Heads, at least 7 Heads. 4

OR

6. a) A manufacturer of marker pens knows that 3% of his product is defective. If he sells marker pens in boxes of 100 pens and guarantees that not more than 5 pens will be defective in a box, find the approximate probability that a box will fail to meet the guaranteed quality. 6

b) 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 first four moments about the mean. Find coefficients of skewness and kurtosis. 6



- c) Assuming that the diameters of 1000 brass plugs taken consecutively from machine form a normal distribution with mean 0.7515 cm. and standard deviation 0.0020 cm. How many of the plugs are likely to be rejected if the acceptable diameter is 0.752 ± 0.004 cm.
 ($z_1 = 2.25, A_1 = 0.4878; z_2 = 1.75, A_2 = 0.4599$).

5

SECTION – II

7. a) With usual notations, establish the following :

$$i) \sum_{r=1}^n Y_r = n_{c_1} y_1 + n_{c_2} \Delta y_1 + n_{c_3} \Delta^2 y_1 \dots \Delta^{n-1} y_1$$

$$ii) \mu^2 = 1 + \frac{\delta^2}{4}$$

$$iii) h D = \log E = 2 \sinh^{-1} \left(\frac{\delta}{2} \right).$$

9

- b) Calculate the value of π , by evaluating suitable integral using

i) Trapezoidal rule

ii) Simpson's $\frac{1}{3}$ -rd rule.

8

OR

8. a) Construct the difference table for $y = \sin x, x = 10^\circ(5^\circ)35^\circ$ and find

i) $\sin 12.5^\circ$ using forward difference formula

ii) $\sin 34.5^\circ$ using backward difference formula

iii) $\sin 22.5^\circ$ using central difference formula.

9

- b) Find the area of the circle of radius 4 (taking $h = 0.5$) using Simpson's $\frac{1}{3}$ -rd rule.

Also find the volume of sphere of radius 4 (taking $h = 0.5$) using trapezoidal rule.

8



9. a) Find cube root of 100 using Newton-Raphson method, correct to 4 decimal places. Write the algorithm of method used in above problem. **8**
- 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	-4	-6	-6	-4	0	6	14

OR

10. a) Solve the following system of equations by using Gauss-Seidel method

$$20x - 3y + 3z = 14$$

$$x - 15y + 2z = 8$$

$$2x - 3y + 25z = 10$$

Find the solution at the end of fifth iteration. **8**

- b) Solve the equation,

$$\frac{dy}{dx} = \frac{y - x}{y + x}, \text{ given } x = 0, y = 1.$$

Using Runge-Kutta method, to find y at $x = 0.4$ taking $h = 0.2$. **8**



11. a) Solve the following Linear programming problem by using Simplex method

$$\text{Maximize } z = x_1 + x_2 + x_3$$

$$\text{Subject to } 4x_1 + 5x_2 + 3x_3 \leq 15$$

$$10x_1 + 7x_2 + x_3 \leq 12$$

$$\text{and } x_1, x_2, x_3 \geq 0.$$

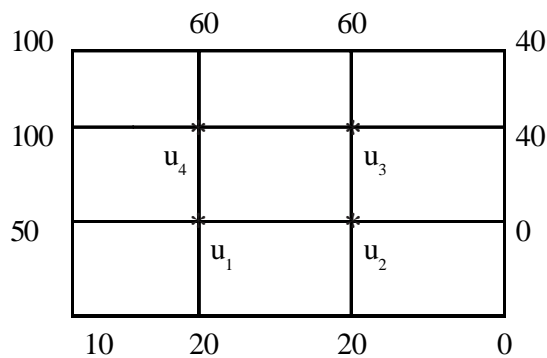
9

b) Solve the equation

$$\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$$

corresponding to the grid shown in the figure.

8



OR



12. a) Solve the equation $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = -100$ for pivotal values on square plate bounded by $x = 0, y = 0, x = 3, y = 3$ ($h = k = 1$) and $u(x, y)$ is zero at every point on the boundary of square plate. **9**

b) Solve the following LP problem, using simplex technique.

$$\text{Maximize } z = 5x_1 + 3x_2$$

$$\text{Subject to } 3x_1 + 5x_2 \leq 15$$

$$5x_1 + 2x_2 \leq 10$$

$$\text{and } x_1, x_2 \geq 0.$$

8



[4063] – 102

T.E. (Petroleum Engineering) (Semester – I) Examination, 2011
PETROLEUM GEOLOGY – I
(2003 Course)

Time : 3 Hours

Max. Marks : 100

- Instructions :** 1) Answers to the questions of **both** the Sections should be written in **separate** answer books.
2) Draw **neat** diagrams **wherever** necessary.
3) Figures to the **right** indicate **full** marks.

SECTION – I

1. A) Explain the term rock cycle with the help of a neat-labelled diagram. **6**
1. B) How are sedimentary rocks recognized from igneous and metamorphic rocks ? **9**
- OR
2. A) Write in brief on observations carried out in sedimentary rocks. **9**
2. B) Describe mode of occurrence of igneous rocks. **6**
3. A) What are convergent and divergent plate boundaries ? **9**
3. B) Explain the relationship between grain size and velocity of water in relation to erosion, transportation and deposition of sediments. **6**
- OR
4. A) Draw the triangular classification of mass movement and describe different terms used. **6**
4. B) How internal structure of earth is interpreted using velocity of seismic waves ? **9**
5. A) What are the flexure and buckle folds ? Draw and explain structures associated with these folds. **10**
5. B) How is presence of normal and reserves faults recognized in wells ? **10**

OR

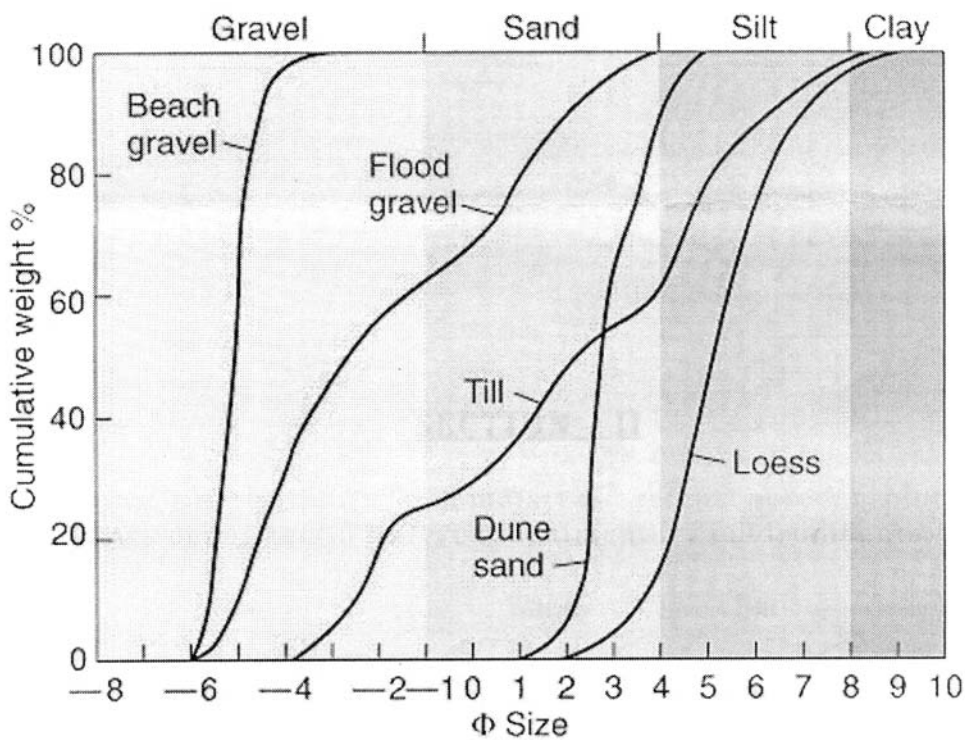
P.T.O.



- 6. A) Draw a representative composite failure envelope on a Mohr diagram along with sketches of fracture geometries that form during failure. 5
- B) Explain clay and shale smears with suitable diagrams. 10
- C) Describe the role of temperature, pressure and water in the deformation of rocks with increasing depth. 5

SECTION – II

- 7. A) Following figure shows a cumulative weight percent plotted for sediments deposited in different sedimentary environments. 10



Classify and discuss maturity and sorting of sediments deposited in different sedimentary environments.

- 7. B) Draw and explain how geological history is reconstructed in the case of an angular unconformity ? 5

OR



- 8. A) What is a difference between grain supported and matrix supported framework in clastic sedimentary rocks ? 5
- 8. B) Discuss the Dunham's Scheme of classification of carbonate rocks. 10
- 9. Write notes on **any three** of the following : 15
 - a) Marine depth zones and distribution of organisms.
 - b) Trace fossils as an indicator of environment of deposition.
 - c) Diagenesis.
 - d) Dolomite and dolomitization.
 - e) Normal Sedimentation and reverse sedimentation.
 - f) Major components of carbonate rock.
- 10. A) Write "Geological Time Scale" in a tabular form with important events in each era. 8
- 10. B) Following sedimentary sequence is encountered in a well during wildcat drilling. A break in sedimentation exists between two successive units. 12

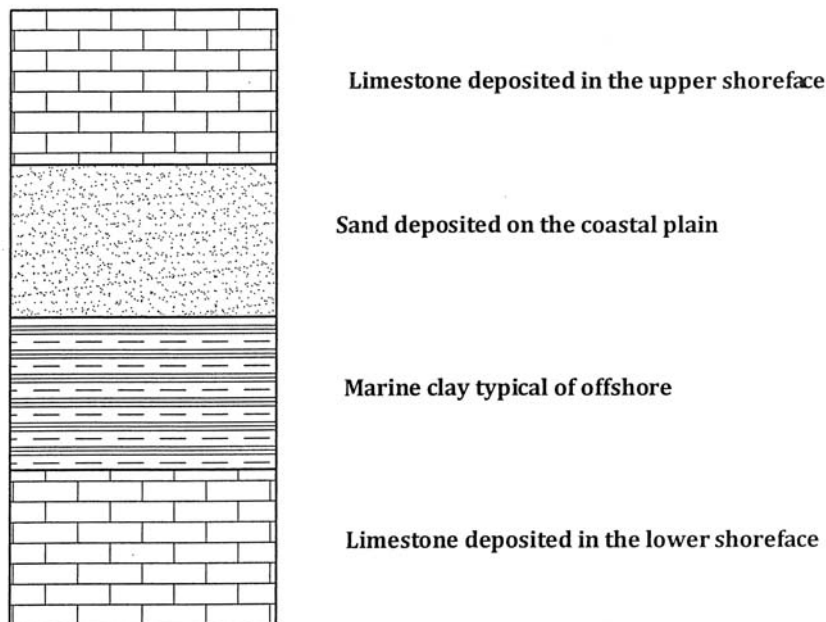


Figure for Q. 10. B

Reconstruct chronology of events based on emergence and submergence of coast. Provide brief explanation in support of your reconstruction. What is progradation and retrogradation ?

OR



11. A) What is geological correlation ? **6**
11. B) What is genetic increment of strata ? Draw a cross section showing relationship between environment, facies and increment of sedimentation. **9**
11. C) How bedforms are generated as a result of grain size and velocity of depositional agent ? **5**



[4063] – 103

**T.E. (Petroleum) (Semester – I) Examination, 2011
DRILLING AND PRODUCTION OPERATIONS
(2003 Course)**

Time: 3 Hours

Max. Marks: 100

- Instructions :** 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) **Black figures** to the **right** indicate **full** marks.
5) **Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator is allowed.**
6) **Assume suitable data, if necessary.**

SECTION – I

1. a) List the various types of well trajectories that are drilled to develop and exploit an oil field. Describe the classification and the basis to select these types of wells. **10**
- b) Draw the neat schematic sketch of a coiled tubing unit. Indicate every component and explain the working of coiled tubing unit in brief. **8**
2. a) Calculate the power requirement for the following pump : **3**
Flow rate = 1200 gpm
Pressure = 2000 psi
Mechanical efficiency = 0.85
- b) It is desired to increase the sp. weight of 300 bbl of 10.5 ppg mud to 11.4 ppg using barite. The final volume is not limited. Determine the new volume of mud. Also determine the weight of the barite to be added (Sp. weight of barite 35.0 ppg). **4**
- c) List the important objectives of rig hydraulics and calculate pressure drop across the bit and nozzle flow velocity if circulation rate is 300 gpm, mud weight is 12 ppg and three nozzles of $\frac{15}{32}$ inch. **9**

P.T.O.



3. a) Draw the neat schematic sketch of a basic BOP configuration for a typical well. Describe the function of each component in brief. **12**
- b) Describe causes of lost circulation and curing methods in brief. **4**
4. Write short notes on : **16**
- a) Use of stabilizers and types.
- b) Rheological classification of Newtonian and Non Newtonian fluids.
- c) Hoisting system.
- d) Fishing tools (types and sketches only) .

SECTION – II

5. a) With reference to the API standards and practices, write the typical casing and corresponding bit sizes, casing clearance for the intermediate, surface and conductor casing if, production casing for a certain well to be used is 5 inch. **6**
- b) Compare the normal single-stage casing cementing and multi-stage casing cementing. **6**
- c) Write the important reasons to conduct squeeze cementing job. **6**
6. Draw the schematic sketches of following equipment. Indicate all the components. **16**
- a) Well head equipment
- b) Christmas tree
- c) Any one type of bottom hole equipment.



7. a) Describe the four basic effects to consider, during analysis of tubing length changes because of pressure and temperature. **8**
- b) Explain the functions of following oilfield -production installations/facilities. **8**
- i) Group gathering station
- ii) Central processing facility.
8. Write short notes on (**any four**) : **16**
- a) Repeat formation testing
- b) Well perforation
- c) Well activation and well swabbing
- d) Wire line operations
- e) Workover problems and solution.



[4063] – 104

T.E. (Semester – I) (Petroleum) Examination, 2011
PRINCIPLES OF CHEMICAL ENGINEERING – I
(2003 Course)

Time : 3 Hours

Max. Marks : 100

- Instructions :**
- 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) *Use* of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is *allowed*.
 - 5) Assume suitable data, *if necessary*.

SECTION – I

1. a) Explain Joule Thomson Expansion with help of neat diagram and elaborate its usefulness. 6
- b) Obtain the expression of entropy change for Ideal Gas. 6
- c) State 2nd law of Thermodynamics and explain the same mathematically. 4

OR

2. a) With help of neat sketch discuss Carnot Cycle and write down equation of its efficiency. 6
- b) Define : Entropy, Closed System, Absolute Temperature. 6
- c) With help of suitable example explain reversible and irreversible processes. 4
3. a) With help of neat diagram explain flow through a converging and diverging nozzle. Discuss its applications and usefulness. 8
- b) Define following :
Stagnation Point, Mach Number, Hypersonic Waves, Pressure Recovery. 8

OR

P.T.O.



4. a) How you can select a pump for the given process requirement ? In this context explain various characteristics of centrifugal pump. **8**
- b) Crude oil and natural gas are flowing together upwards out of a petroleum reservoir. What are the possible various flow regimes possible for this process discuss with help of neat diagram ? **8**
5. a) Differentiate between CSTR and PFR. **6**
- b) Obtain the mathematical expression for liquid phase 2nd order reaction in an ideal plug flow reactor. **8**
- c) Explain the methodology of obtaining reaction kinetics from batch data. **4**

OR

6. a) Differentiate between : **8**
- i) Diffusion flame and Premixed flame
- ii) Flame Propagation and Detonation.
- b) Why combustion engineering is a very important subject to all petroleum engineers ? Discuss with help of relevant examples. **6**
- c) With help of suitable example explain order and molecularity of reaction. **4**

SECTION – II

7. a) Calculate molar volume of iso-butane at 456 K and 8 bar considering van der Waals equation of state.
Given that, the critical temperature = 408 K and critical pressure = 36.48 bar for the above mentioned hydrocarbon. **8**
- b) Define and explain following :
Compressibility factor, Acentric factor. **4**
- c) The vapor phase molar volume of an unsaturated hydrocarbon is reported to be 32,543 cm³/mol at 325 K and 1 bar. No other data is available. Without considering ideal gas law, determine a reasonable estimate of molar volume of vapor at 400 K and 2.3 bar. **6**

OR



8. a) Discuss the van der Waal equation of state with help of P-V diagram and elaborate its major contribution. **6**
- b) Write down complete expression of any two equation of state with proper explanation of all the associated terms. **6**
- c) With help of neat diagram explain PVT behavior of fluids. **6**
9. a) Discuss the lab scale measurement of VLE data. How the obtained results must be plotted ? **6**
- b) Define chemical potential and highlight its significances. **4**
- c) Discuss the Gibbs-Duhem equation and provide its expression in different forms. In this context highlight its major field of application. **6**

OR

10. a) Discuss Raoult's law and Henry's law and comment on their applicability and significances. **6**
- b) Define and differentiate : Fugacity Coefficient and Activity Coefficient. **4**
- c) Derive and discuss : **6**
- i) Clapeyron Equation
- ii) Clausius - Clapeyron Equation.
11. a) Gas Hydrates may cause Tsunami and even Earth Quake. Explain and Elaborate. **8**
- b) With help of neat phase diagram explain the formation of Gas Hydrates. Indicate the zone of stable hydrate formation. **8**

OR

12. a) There are many challenges to be tackled in order to utilize Gas Hydrate as potential source of energy. Explain in details. **8**
- b) Name all the gases which can produce gas hydrates. **8**



T.E. (Petroleum) (Semester – I) Examination, 2011
PETROLEUM FIELD INSTRUMENTATION AND CONTROL
(2003 Course)

Time : 3 Hours

Total Marks : 100

- Instructions :* 1) Attempt **any 3** questions from **each** Section.
2) Figures to the **right** indicate **full** marks.
3) **Use of electronic calculators, is allowed.**
4) **Draw neat sketch wherever necessary.**

SECTION – ONE

1. a) Describe the procedure to calibrate a Rotameter of range 2000 liters per hour. **8**
- b) Explain the term fidelity, dynamic error, speed of response and measurement lag. **4**
- c) Classify and define the characteristics of an instrument with respect to its accuracy. **4**
2. a) List various level measuring instruments. Explain any one instrument in detail used in petroleum field application. **7**
- b) A venturimeter with throat diameter 0.07 m and coefficient of discharge 0.90 is used to calibrate a pitot static tube. Air flows through a 110 mm diameter pipe in which the venturi is fitted. The difference in water level in the manometer attached to the venturi is 60 mm. The pitot static tube is placed at the down stream of the venturi. Water manometer attached to it shows a reading of 7 mm. Calculate the flow rate through the pipe and the coefficient of velocity of the pitot tube. Assume the density of air as 1.13 kg/m^3 and that of water as 1000 kg/m^3 . **6**
- c) Give the principle of thermocouple. What do you mean by J type and K type thermocouple ? **5**

P.T.O.



- 3. a) Explain Pipeline instrumentation in detail. **8**
- b) Explain instrumentation involved in Drilling Operation. **8**
- 4. a) Explain the Lease Automatic Custody Transfer (LACT). **6**
- b) Describe any two petroleum field applications with respect to instrumentation with proper sketch. **10**

SECTION – TWO

- 5. a) Explain the significance of having a “system approach” in process control. Give example to justify your answer. **6**
- b) Why is it necessary to define the order of the system with respect to process control ? **6**
- c) Explain with utility, different hardware components of a simple feedback loop. **6**
- 6. a) Explain the role of different control modes giving their characteristic response following a step change, with proper sketch. **8**
- b) Distinguish between Feedback and Feedforward control action. How is Cascade control scheme different from these two control schemes ? **8**
- 7. a) Explain how Programmable Logic Controller can be used in gas-oil-water separator unit. **10**
- b) Explain what is controller tuning. Give the procedure of control tuning. **6**
- 8. a) Explain different components in SCADA system. Give its application in petroleum industry. **8**
- b) Write a short note on shell and tube heat exchanger control with proper diagram. **8**



T.E. (Petroleum Engineering) (Semester – II) Examination, 2011
PROPERTIES OF RESERVOIR ROCKS AND FLUIDS
(2003 Course)

Time : 3 Hours

Max. Marks : 100

- Instructions :** 1) Answers to the **two** Sections must be written in separate answer books.
2) Attempt **three** questions from **each** Section.
3) Figures to the **right** indicate **full** marks.
4) Neat diagrams should be drawn **wherever** necessary.
5) Use of a non-programmable calculator is **allowed**.
6) Assume suitable data if necessary.

SECTION – I

1. Derive the radial flow equation for turbulent gas flow. **18**
2. Write an essay on stress on rock properties. **16**
3. Define R_s , B_o , c_o , μ_o , B_g , μ_g , c_g , B_w , c_w and explain each with a variation in pressure. Explain how each is experimentally calculated. **16**
4. a) Define porosity and explain jamin effect. **6**
b) Write a note on three phase permeability. **5**
c) Derive an expression for gas flow in porous media. **5**

SECTION – II

5. a) Draw and explain PV, PT, P-x, P-density diagrams for a single, dual and multi-component system. **10**
b) Where does flash and differential liberation occur, explain. **6**
6. a) What are K values ? Explain. **8**
b) Explain in detail how a flash calculation is done. **8**
7. a) Derive the Laplace's equation and explain its significance. **9**
b) Explain one method to measure capillary pressure. **9**
8. Derive the Redlich Kwong EOS in terms of Z. What is Z_v and Z_1 . **16**



T.E. (Petroleum) (Semester – II) Examination, 2011
PETROLEUM PRODUCTION ENGINEERING – I
(2003 Course)

Time : 3 Hours

Max. Marks : 100

- Instructions :** 1) Answer Q. No. 1 or 2, Q. No. 3 or 4, Q. No. 5 or 6 from Section – I and Q. No. 7 or 8, Q. No. 9 or 10, Q. No. 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) Black 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

1. a) Define and explain the following properties with the help of graph. 12
- i) Viscosity of oil
 - ii) Specific Gravity of Oil
 - iii) Bubble-point pressure
 - iv) Gas formation volume factor.
- b) Draw and explain the generic nature of an IPR curve for a solution gas drive reservoir below and above bubble point pressure. 6

OR

2. a) State and explain any two correlations used to construct IPR curve. 9
- b) Draw the generic trend of Pressure, GOR and P.I. against time for reservoirs having gas cap drive and water drive mechanism. 9
3. a) Draw the schematic sketch and explain in brief various types of flow regimes during flow through vertical production tubing. 6
- b) Discuss in brief the Gilbert's method/procedure to select optimum tubing size and operating point for the given IPR curve, reservoir data and production conditions. Draw the typical graph of vertical lift performance. 10

OR

P.T.O.



4. a) Draw the schematic sketch of a surface choke and write the functions of it. **8**
- b) What is the difference between GOR and GLR ? Write the unit of it Draw the relevant graphs and explain the concept of optimum GLR. **8**
5. a) What is hydraulic fracturing ? Describe the necessary elements and the general design considerations to accomplish a hydraulic fracturing job. **10**
- b) Write the meaning of fracture gradient, fracture conductivity and fracture geometry. **6**

OR

6. a) Discuss in detail matrix acidization operation. **10**
- b) What is the purpose of well stimulation job ? Explain. **6**

SECTION – II

7. Write short notes on the following : **18**
- a) Liquid loading of gas well
- b) Water and gas coning
- c) Sand control
- d) General reasons for decrease in well productivity.

OR

8. a) What is workover job ? Explain any two workover problems and their solution in brief. **12**
- b) Write the applications of Horizontal Well Technology. **6**
9. a) Design a two phase horizontal separator using the following data : **10**

Gas flow rate (Q_g) = 10 MM scf/day

Oil flow rate (Q_o) = 2100 bbls/day for 42° API

Operating Pressure = 960 psia

Operating Temperature = 60 °F



Specific Gravity of Gas = 0.6

Gas compressibility = $Z = 0.83$

From graph, value of $k = 0.284$ (Constant based on liquid gas properties)

Liquid drop to be separated = $d_m = 100$ micron

Assume slenderness ratio of 3 and 4. Retention time 2, 2.5 and 3 minutes.

- b) Discuss the mechanism of oil and gas separation used in two phase oil and gas separator. **6**

OR

10. a) Draw the neat schematic sketch and explain the principle of operation and working of three phase vertical separator in detail. **12**

- b) Explain 'mist extractor' in brief. **4**

11. a) Write the various possible safety issues at production facility and their solution in brief. **8**

- b) Discuss the general stages involved in oil and gas processing and its transportation till central processing facility. **8**

OR

12. Explain the following (**any four**) : **16**

- i) Group Gathering Station
 - ii) Heater treater
 - iii) Emulsion treating methods
 - iv) Skimmer tank
 - v) Theory of emulsion.
-



[4063] – 110

T.E. (Petroleum) (Semester – II) Examination, 2011
DESIGN OF PETROLEUM MACHINERY
(2003 Course)

Time : 3 Hours

Max. Marks : 100

Instruction : Answer any three questions from each Section.

SECTION – I

1. a) Enumerate the different types of stresses induced in tubulars used in oil and gas wells. Write the various steps for the design of petroleum field equipment. **8**
- b) A leather belt, 10 mm × 240 mm is used to drive a C.I. pulley 900 mm in diameter at 330 rpm. If the active arc on smaller pulley is 120° and the stress in the tight side is 2 N/mm², find the power capacity of the belt. The density of leather belt may be taken as 980 kg/m³ and co-efficient of friction of leather on C.I. is 0.35. **10**
2. a) Write notes on (**any four**) : **16**
 - i) Working Mechanism of any type of break
 - ii) Power transmission mechanism on rig
 - iii) Mechanical properties of engineering materials
 - iv) Factor of safety
 - v) Types of belt drives.
3. a) A drill pipe is to be used to transmit torque at the bit. The power available is 1000 kW with 100 rpm is to be applied. If the material having permissible shear stress 70 N/mm² and ratio of OD/ID of pipe is 2, find out the wall thickness of drill pipe. **12**
- b) What is cavitation ? Discuss effect of cavitation in brief. **4**
4. a) Design and draw a protective type iron Flange coupling for steel shaft transmitting at 15 kW at 200 rpm and allowable shear stress of 40 MPa. The working stress in the bolts should not be more than 31 MPa. Assume that the same material is used for shaft and key. Crushing stress, is twice the value of shear stress. The maximum torque is 25% greater than full load torque. The shear stress for C.I. is 14 MPa, For design of key use following data. Width = 16 mm, Thickness = 16 mm length = 75 mm, no. of bolts = 4, determine diameter of bolt and design flange. **16**

P.T.O.



SECTION – II

5. a) A pressure vessel consist of a cylindrical shell is enclosed by a torispherical head. The volume of vessel is 2.8 m^3 and length is limited to 3m. The yield strength of the steel plate used is 270 N/mm^2 and factor of safety is 1.6. The weld joint efficiency is 85%. Design the shell and head for internal operating pressure of 1 N/mm^2 . Use appropriate corrosion allowance. **10**
- b) What are the different types of losses takes place in storage tank for petroleum fluids ? **8**
6. Write short notes on **any four** of following :
- a) Selection of pumps
- b) Different types of heads and closures
- c) Storage tank roofs
- d) LMTD
- e) Types of Agitators. **16**
7. a) Discuss advantages and disadvantages of fixed tube, floating head and V tube heat exchangers. **10**
- b) What are the different types of tests conducts for testing of pressure vessel ? **6**
8. a) What are different types of oil and gas separators and explain design considerations for three phase vertical separator with suitable sketches. **10**
- b) Give the significance of critical pressure. **2**
- c) Explain in brief – Baffles in heat exchanger. **4**



[4063] – 111

T.E. (Petrochemical Engineering) (Semester – I) Examination, 2011
CHEMICAL PROCESS INDUSTRIES
(2003 Course)

Time : 3 Hours

Max. Marks : 100

- Instructions :**
- 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.

SECTION – I

1. a) Describe with flowsheet the contact process for manufacture of sulphuric acid. **12**
b) Mention major engineering problems in production of lime. **6**
2. a) Describe with flowsheet the solvay process for manufacture of soda ash. **12**
b) Mention end uses of phosphoric acid and ethanol. **4**
3. a) Describe with flowsheet the Raschig-Olin process for manufacture of hydrazine. **12**
b) Mention major engineering problems in production of ethanol by fermentation. **4**
4. a) Describe with flowsheet the Bergiur process for manufacture of aromatic liquids from coal. **12**
b) Mention end uses of nitric acid and caustic soda. **4**

SECTION – II

5. a) Describe with flowsheet the extraction process for manufacture of crystal sugar. **12**
b) Differentiate between soaps and detergents and write a note on detergent builders. **6**
6. a) Describe with flowsheet the continuous hydrolysis process for manufacture of soap and glycerine. **12**
b) Write a note on by-products of sugar industry. **4**
7. a) Describe with flowsheet the ammonium carbamate decomposition process for manufacture of urea. **12**
b) Write a note on carbohydrates and their applications. **4**
8. a) Describe any one method for preparation of glycerine from propylene. **6**
b) Describe the process for preparation of gur from sugarcane. **5**
c) Write a note on dyes and their classification. **5**



[4063] – 112

**T.E. (Petrochemical) (Semester – I) Examination, 2011
MATHEMATICS FOR PETROCHEMICAL ENGINEERS
(2003 Course)**

Time: 3 Hours

Max. Marks: 100

- Instructions :** 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 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) Black figures to the **right** indicate **full** marks.
- 5) Use of logarithmic tables, slide rule, electronic pocket calculator and steam tables is **allowed**.
- 6) Assume suitable data, **if necessary**.

SECTION – I

1. a) A firm manufactures two types of products A and B and sells them at a profit of Rs. 2 on type A and Rs. 3 on type B. Each product is processed on two machines G and H. Type A requires one minute of processing time on G and two minutes on H; type B requires one minute on G and one minute on H. The machine G is available for not more than 6 hours 40 minutes and machine H is available for 10 hours during any working day.

Formulate the problem as a linear programming problem for maximum profit.

6

- b) Solve the following LP problem :

10

$$\text{Maximize } z = 3x_1 + 2x_2$$

Subject to the constraints

$$x_1 + x_2 \leq 4$$

$$x_1 - x_2 \leq 2$$

$$x_1, x_2 \geq 0$$

OR

P.T.O.



2. a) Obtain the dual of the following LP problem :

6

$$\text{Maximize } z = 3x_1 + 4x_2$$

Subject to constraints

$$2x_1 + 6x_2 \leq 16$$

$$5x_1 + 2x_2 \geq 20$$

$$x_1, x_2 \geq 0$$

b) Apply the principle of duality to solve following LP problem.

10

$$\text{Maximize } z = 4x_1 + 2x_2$$

Subject to

$$x_1 + x_2 \geq 3$$

$$x_1 - x_2 \geq 2$$

$$x_1, x_2 \geq 0$$

3. a) Five men are available to do five different jobs. From past records, the time (in hours) that each man takes to do each job is known and given in the following table. Find the assignment of men to jobs that will minimize the total time taken.

6

		Jobs				
		I	II	III	IV	V
Man	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) Determine the optimum basic feasible solution to the following transportation problem to minimize the cost. 10

		To			Availability
		A	B	C	
From	I	50	30	220	1
	II	90	45	170	3
	III	250	200	50	4
Demand		4	2	2	

Use Vogel's approximation method for initial basic feasible solution.

OR

4. a) ABC company is engaged in manufacturing 5 brands of packed snacks. It is having 5 manufacturing setups, each capable of manufacturing any of its brands, one at a time. The cost to make a brand on these setups vary according to the following table. Assuming 5 setups are S_1, S_2, S_3, S_4 and S_5 and brands are B_1, B_2, B_3, B_4 and B_5 , find the optimum assignment of products on these setups resulting in the minimum cost. 6

	B_1	B_2	B_3	B_4	B_5
S_1	4	6	7	5	11
S_2	7	3	6	9	5
S_3	8	5	4	6	9
S_4	9	12	7	11	10
S_5	7	5	9	8	11



- b) Use Vogel’s approximation method to find optimum solution of the following transportation problem for minimum cost. The availability at A, B, C are 2, 6 and 7 units respectively and requirement at I, II, III, IV are 3, 3, 4 and 5 units respectively.

10

		To			
		I	II	III	IV
From	A	15	10	17	18
	B	16	13	12	13
	C	12	17	20	11

5. a) Find coefficient of correlation 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) The mean and variance of Binomial distribution are 6 and 2 respectively. find $p(r \geq 1)$.
- c) The average number of misprints per page of a book is 1.5. Assuming the distribution of number of misprints to be Poisson distribution, find
- The probability that a book is free from misprints.
 - Number of pages containing more than one misprint if book contains 900 pages.

5

6

OR

6. a) Obtain regression lines for the following data.

7

x	6	2	10	4	8
y	9	11	5	8	7



- b) In a normal distribution, 7% of the items are under 35 and 89% are under 63. Find the mean and standard deviation of the distribution. **5**

Given $Z = 1.48, \quad 1.23$

Area = 0.43, 0.39

- c) A set of five similar coins is tossed 210 times and the result is shown in the following table. **6**

Number of Heads	0	1	2	3	4	5
Frequency	2	5	20	60	100	31

Test the hypothesis that the data follow a binomial distribution,
Given $\chi^2_{5,0.05} = 11.070$.

SECTION – II

7. a) i) Prove that $\mu\delta = \frac{\Delta}{2} + \frac{\Delta E^{-1}}{2}$
ii) Prove that $1 - e^{-ho} = \nabla$. **8**

- b) Find $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$ at 1.5 from the following table. **8**

x	1.5	2.0	2.5	3.0	3.5	4.0
y=f(x)	3.375	7.0	13.625	24.0	38.375	59.0

OR



8. a) Using Stirling's formula compute y_{35} (y at 35) given that 8

x	10	20	30	40	50
y	600	512	439	346	243

- b) The speed of a train which starts from rest is given by the following table, the time being recorded in minutes from the start and the speed is kilometers per hour. Find approximately the total distance run in 20 minutes. 8

t	2	4	6	8	10	12	14	16	18	20
V = speed	10	18	25	29	32	20	11	5	2	0

9. a) Find the root of the equation $x^3 - 5x - 7 = 0$, that lies between 2 and 3, correct to 3 decimal places using method of false position. 8
- b) Solve the following system of equations by Gauss elimination method.

$$x_1 + 2x_2 + 3x_3 + 4x_4 = 10$$

$$7x_1 + 10x_2 + 5x_3 + 2x_4 = 40$$

$$13x_1 + 6x_2 + 2x_3 - 3x_4 = 34$$

$$11x_1 + 14x_2 + 8x_3 - x_4 = 64$$

9

OR

10. a) Solve the following system of equations, up to 4 iterations by Gauss Seidal method.

$$30x - 2y + 3z = 75$$

$$x + 17y - 2z = 48$$

$$x + y + 9z = 15.$$

8

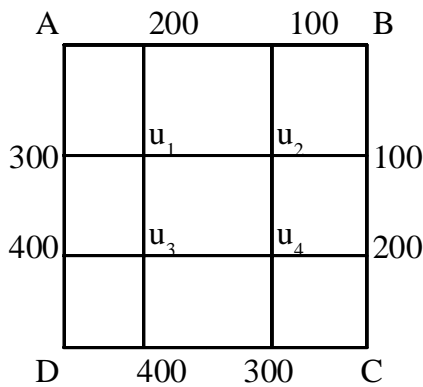


b) Fit a straight line to the following data by the method of least square. **9**

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

11. 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 elliptic equation $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$ for the following square mesh
with boundary values as shown below. **9**



OR

12. a) Solve $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = -10(x^2 + y^2 + 10)$ over the square with sides $x = 0 = y$,
 $x = 3 = y$; with $u = 0$ on the boundaries and mesh length 1. **8**

b) Determine using modified Euler's method the value of y when x = 0.1
given that

$\frac{dy}{dx} = x^2 + y$ $y(0) = 1$ and $h = 0.05$. **9**



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T.E. (Semester – I) (Petrochemical) Examination, 2011
DIFFUSION AND MASS TRANSFER
(2003 Course)

Time : 3 Hours

Max. Marks : 100

- Instructions :**
- 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) **Black** figures to the **right** indicate **full** marks.
 - 5) **Use** of logarithmic tables, electronic pocket calculator and steam tables is **allowed**.
 - 6) **Assume** suitable data, if necessary.

SECTION – I

1. Answer the following questions in brief (**any four**) : **18**
- a) Write down advantages and disadvantages of distillation over absorption.
 - b) Draw the operating line and equilibrium curve for an absorber and stripper.
 - c) State equations to determine diffusivity in gases and explain the terms involved in it.
 - d) Explain the term stage and stage efficiency.
 - e) Draw a graph showing concentration gradient for steady state diffusion of one gas.
 - f) Give the relationship between mass transfer coefficient and diffusivity.
 - g) State and explain Fick's law of diffusion.

OR

2. a) An absorption tower has been proposed to remove selectively two pollutants, hydrogen sulfide and sulfur dioxide, from an exhaust gas stream with molar composition 4.0% H₂S, 6.0% SO₂, and 90.0% air. The gas mixture is at 373 K and 1 atm. using an appropriate empirical correlation, calculate the diffusivity of :
- a) Hydrogen sulfide in the gas mixture,
 - b) Sulfur dioxide in the gas mixture.

P.T.O.



Date : Molecular volumes for hydrogen sulfide, sulfur dioxide and Air are 20.96 cm³/gm mole, 41.1 cm³/gm mole and 20.1 cm³/gm mole respectively. **10**

b) Solve the following : **8**

i) Prove that $D_{AB} = D_{BA}$

ii) Prove that $J_A + J_B = 0$

3. a) A flat plug 30 mm thick having an area of $3.0 \times 10^{-4} \text{ m}^2$ and made of vulcanized rubber is used for closing an opening in a container. The gas CO₂, at 25°C and 2.0 atm pressure is inside the container. Calculate the total leakage of CO₂ through the plug to the outside in kg mol CO₂/s at steady state. Assume that the partial pressure of CO₂ outside the container is zero.

Data :

For CO₂ in vulcanized rubber $S = 0.950 \text{ m}^3_{\text{STP}}/\text{m}^3 \cdot \text{atm}$, and

$$D_{\text{CO}_2} = 0.12 \times 10^{-9} \text{ m}^2/\text{s}$$

You may use the following expression :

$$N_A = -\frac{P_M \Delta P_A}{22.4 \Delta z}, \text{ Where } P_M \text{ is the permeability of gas A in the solid.} \quad \mathbf{8}$$

b) A gas mixture at a total pressure of $1.5 \times 10^5 \text{ Pa}$ and 295 K contains 20% H₂, 40% O₂, and 40% H₂O by volume. The absolute velocities of each species are – 10 m/s, –2 m/s, and 12 m/s, respectively, all in the direction of the z-axis.

a) Calculate the mass average velocity, v , and the molar average velocity, V , for the mixture.

b) Determine the four fluxes : $I_{\text{O}_2,z}, J_{\text{O}_2,z}, J_{\text{O}_2,z}, J_{\text{NO}_2,z}$ **8**

OR



4. a) Use Wilke-Chang correlation to estimate the diffusivity of ethyl benzene into water at 293 K. The viscosity of water at this temperature may be taken as 1 cP and density of ethyl benzene at normal boiling temperature (409.3 K) is 0.761 gm/cm³. Assume association factor $\Phi = 2.26$. Compare this value with experimental value of $D_{AB} = 0.181 \times 10^{-5}$ cm²/s. **6**
- b) Molecules of hydrogen Chloride (HCl) diffuse through a thin, static film of water 4.0 mm thick at 10°C . The concentration of HCl at one boundary of the film is 12.0% w/w HCl (density = 1060.7 kg/m³), and at the other boundary is 6.0% w/w HCl (density = 1030.3 kg/m³). The diffusion coefficient of HCl in water is 2.5×10^{-9} m²/s. Assuming steady state and one boundary impermeable to water, calculate the flux of HCl using both exact and dilute formulae. Does the dilute formula approximate well to the exact one here ? **10**
5. Write short notes on : **16**
- i) Comparison of Packed Tower and Tray Tower
 - ii) Theories of Mass Transfer
 - iii) Winklemann's method for estimation of diffusivity of vapors.

OR

6. A solid disc of benzoic acid 2.5 cm in diameter is spinning at 20 rpm and 25°C. How fast will it dissolve in a large volume of water ? How fast will it dissolve in a large volume of air ? The diffusion coefficients are 1×10^{-5} cm²/sec. in water and 0.233 cm²/sec. in air. The solubility of water is 0.003 gm/cm³, its equilibrium vapour pressure is 0.30 mm Hg.

You may use following correlation to find mass transfer coefficient : **16**

$$k = 0.62 D \left(\frac{\omega}{\nu} \right)^{1/2} \left(\frac{V}{D} \right)^{1/3}$$



SECTION – II

7. a) The average heat transfer coefficient for natural convection from a single sphere in a large body of fluid is given by

$$\frac{hd}{k} = 2 + 0.6 \left(\frac{d^3 \rho^2 g \beta \Delta}{\mu^2} \right) \left(\frac{c_p \mu}{k} \right)^{1/3} \text{ for } Gr^{1/4} Pr^{1/3} < 300$$

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 analog between mass and heat transfer, calculate the instantaneous rate of sublimation at the surface of a naphthalene sphere in air at 145.5°C and 1 atm.

Explain the analogy between $Nu = Sh$, $Sc = Pr$, $Gr = Gr_{AB}$.

Data : $P_{\text{naphthalene}}^{\text{vap}} = 0.13 \text{ atm}$, $D_{AB} = 5.85 \times 10^{-6} \text{ m}^2/\text{s}$, $d = 6.5 \times 10^{-2} \text{ m}$

$\rho_{\text{air}} = 0.819 \text{ kg/m}^3$, $\mu_{\text{air}} = 2.25 \times 10^{-5} \text{ kg/m.s}$

8

- b) The following data were obtained from wetted wall column employing a constant liquid flow rate :

Molar gas flow rate, G_m , (kmol/sec)	Overall mass transfer coefficient K_G (kmol/m ² .sec (kN/m ²) $\times 10^6$)
0.01	50.8
0.02	67.2
0.04	84.0
0.06	91.7
0.08	93.5
0.10	100



The relationship between the equilibrium vapor pressure P_{A1} (kN/m²) and the molar concentration in the liquid phase C_{A1} (kmol/m³) is given by :

$P_A = 25C_A$. For a gas flow rate of 0.05 kmol/sec, calculate the overall and individual mass transfer coefficients. You may use the following correlation :

$$\frac{1}{K_G} = \frac{1}{K_g} + \frac{m}{K_l}$$

Where K_G = overall mass transfer coefficient for the gas phase

m = Henry's law constant.

It is given that $0.85 K_g \propto G_m^{0.8}$, where G_m = gas velocity.

10

OR

8. a) Prove or show the following relationships starting with the flux equations : **9**

a) Convert k'_C to k_y and k_G ;

b) Convert k_L to k_x and k'_x ;

c) Convert k_G to k_y and k_C .

b) An air stream at 52.6°C and 2 atmospheres (abs.) flows through a duct at 1.524 m/s past samples of solid naphthalene. Naphthalene diffusivity at 0°C and 101.32 kPa is 5.16×10^{-6} m²/s.

Estimate mass transfer coefficient k'_C for flow past the following shapes :

a) Parallel to a flat plate 152 mm long ;

b) A lone sphere of 12.7 mm diameter.

Data : at 52.6°C and 2 atm (abs.)

$$\mu = 1.96 \times 10^{-5} \text{ kg/m.s}$$

$$\rho = 1.087 \text{ kg/m}^3$$

$$D_{AB} = 3.51 \times 10^{-6} \text{ m}^2/\text{sec.}$$

9

9. a) A mixture of oxygen and acetone vapor at a total pressure of 1050 mm Hg at 25°C has a percentage saturation of 75%.

Calculate the following :

a) The molal humidity

b) Absolute humidity



- c) Relative humidity
- d) Volume percent acetone
- e) Molal humid volume and
- f) Molal humid heat.

The saturation vapor pressure of acetone at 25°C is 290 mm Hg and the specific heats of oxygen and acetone vapor are 0.25 and 0.35 kcal/kg°C respectively.

6

- b) Specify the important properties a packing material should possess for being used in mass transfer equipment. Name a few packing materials. 4
- c) What are the different types of cooling towers used in process industries ? Briefly explain them. 6

OR

10. In order to test the feasibility of drying a certain foodstuff, drying data were obtained in a tray dryer with airflow over the top of the exposed surface having an area of 0.186 m². The bone-dry sample weight was 3.765 kg dry solid. At equilibrium after a long period, the wet sample weight was 3.955 kg H₂O plus solid. Hence 3.955 – 3.765, or 0.190 kg of equilibrium moisture was present. The following sample weights versus time were obtained in the drying test.

Time (hr)	0	0.4	0.8	1.4	2.2	3.0	4.2	5.0	7.0	9.0	12.0
Weight (kg)	4.94	4.88	4.80	4.69	4.55	4.40	4.24	4.15	4.01	3.97	3.95

- a) Calculate the free moisture content X kg H₂O/kg dry solid for each data point and plot W versus time (Hint: for 0 hrs, 4.944 – 0.190 – 3.765 = 0.989 kg free moisture in 3.765 kg dry solid. Hence X = 0.989/3.765).
- b) Measure gradients along the drying curve, calculate the drying rate R, and plot R versus X.

16



11. A 0.15-m-long, 0.015-m-diameter test tube containing ethanol is left open in the laboratory. The level of ethanol is initially 0.1 m below the top. The temperature in the laboratory is 26°C and the atmospheric pressure is 0.987 atm. The vapor pressure of ethanol is 0.08 atm. If the concentration of ethanol in the air outside the test tube is negligible and the concentration of ethanol near the liquid surface can be calculated using Dalton's law, determine :

- a) An expression for the concentration profile of ethanol in air inside the test tube if the liquid level is held constant.
- b) An expression for the instantaneous molar flux of ethanol. **16**

OR

12. Write short notes on : **16**

- i) Two Resistance Concept in Interphase Mass Transfer
- ii) Types of industrial dryers
- iii) Rate of drying curve.



T.E. (Petrochemical) (Semester – II) Examination, 2011
MASS TRANSFER OPERATIONS
(2003 Course)

Time : 3 Hours

Total Marks : 100

- Instructions :**
- 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) **Black** figures to the **right** indicate **full** marks.
 - 5) **Use** of logarithmic tables, electronic pocket calculator and steam tables is **allowed**.
 - 6) **Assume** suitable data, if **necessary**.

SECTION – I

1. A distillation column is separating mixture of water (MVC) and acetic acid input to the column at two locations. Both feeds are 1000 kmol/hr but one contains 65% water and the other 50% . The top and bottom products are saturated liquids containing 98-mol% and 5-mol % water. Determine the optimal feed stage for each feed and the number of stages required, if the column is operated at a reflux ratio 20% larger than the minimum reflux ratio. The vapour liquid equilibrium data is given below :

Data :

X	0.005	0.05	0.13	0.21	0.30	0.51	0.65	0.80	0.96
Y	0.011	0.13	0.24	0.34	0.44	0.63	0.75	0.87	0.97

OR

16

P.T.O.



2. A waste-gas stream (100 mol/hr) from your plant contains 20 mol% H_2S and 80 mol% N_2 (dry basis) and is produced at 20 psia. The pollution control board rules that the waste gas can be discharged to the atmosphere only if it contains 1.0 mol% H_2S or less. The waste-gas stream is at $20^\circ C$ and is saturated with water vapor. Henry's law constants are given in Appendix B of the text.

- 1) Why would distillation not be a good choice for this process ?
- 2) You decide to use water as a solvent and to build an absorption tower to treat the waste-gas stream. Assume the tower operates at 20 psia and $20^\circ C$. What is the minimum solvent flow rate required ? If the solvent flow rate is set at 1.2 times the minimum, how many equilibrium stages are required ?
- 3) What do you think about the choice of water as the solvent ?

16

3. 1000 kg/hr of a mixture containing 42 mole percent heptane and 58 mole percent ethyl benzene is to be fractionated to a distillate containing 97 mole percent heptane and a residue containing 99 mole percent ethyl benzene using a total condenser and feed at its saturated liquid condition. The enthalpy concentration data for the heptane-ethyl benzene at 1 atm pressure are as follows :

X_{heptane}	0	0.08	0.18	0.25	0.49	0.65	0.79	0.91	1.0
Y_{heptane}	0	0.28	0.43	0.51	0.73	0.83	0.90	0.96	1.0
$H_I \text{ (kJ/kmol)} \times 10^{-3}$	24.3	24.1	23.2	22.8	22.05	21.75	21.7	21.6	21.4
$H_V \text{ (kJ/kmol)} \times 10^{-3}$	61.2	59.6	58.5	58.1	56.5	55.2	54.4	53.8	53.3



Calculate the following :

- a) Minimum reflux ratio
- b) Minimum number of stages at total reflux
- c) Number of stages at reflux ratio of 2.5
- d) Condenser duty
- e) Reboiler duty.

18

OR

4. a) A still has a liquor composition of o-xylene 10%, m-xylene 65%, p-xylene 17%, benzene 4%, and ethyl benzene 4%. How many plates at total reflux are required to give a product of 80% m-xylene and 14% p-xylene ? The data are given as mole percent.

8

- b) In designing a bubble-cap rectification column, the plate spacing was taken equal to 300 mm. Vapour flows through the column at a rate of 3200 m³/hr. The density of the vapour is 1.25 kg/m³. The density and rate of flow are given for standard conditions. The density of the liquid is 430 kg/m³. Determine the required diameter of the column if the absolute pressure in it is 1.2 atm. and the mean temperature is – 40°C. The permissible velocity of the vapour related to the total cross-sectional area of the column in m/sec is given by :

$$V = \sqrt{\frac{\rho_l}{\rho_v}}$$

where, ρ_l and ρ_v are the densities of the liquid and the vapour

respectively in kg/m³.

10



5. 1000 kg/hr of a mixture containing 42 mole percent heptane and 58 mole percent ethyl benzene is to be fractionated to a distillate containing 97 mole percent heptane and a residue containing 99 mole percent ethyl benzene using a total condenser and feed at its saturated liquid condition. The enthalpy-concentration data for the heptane-ethyl benzene at 1 atm pressure are as follows :

x heptane	0	0.08	0.18	0.25	0.49	0.79	0.91	1.0
y heptane	0	0.28	0.43	0.51	0.73	0.90	0.96	1.0
Hl (kJ/kmol) $\times 10^{-3}$	24	24.1	23.2	22.8	22.05	21.7	21.6	21.4
Hv (kJ/kmol) $\times 10^{-3}$	61	59.6	58.5	58.1	56.5	54.4	53.8	53.3

Calculate the following :

- Minimum reflux ratio
- Minimum number of stages at total reflux
- Number of stages at reflux ratio of 2.5
- Condenser duty
- Reboiler duty.

16

OR

- Discuss in brief the principles of Extractive and Azeotropic distillation. **8**
 - Write a note on : Optimum Reflux Ratio. **8**



SECTION – II

7. A feed of 13,500 kg/h consists of 8.0 wt% acetic acid (B) in water (A). The removal of the acetic acid is to be accomplished by liquid-liquid extraction at 25°C. The raffinate is to contain only 1.0 wt % acetic acid. The following four solvents, with accompanying distribution coefficient in mass fraction units, are being considered. Water and each solvent (C) can be considered immiscible. For each solvent, estimate the mass flow rate in kg required per hour if a single equilibrium stage is used. Do you get more separation with a solvent with high K_D or low K_D ? Explain. (Note : the weight percentage here are in total basis, you will need to convert them to solvent basis to use the mass balance equations). **16**

Solvent	K_D
Methyl acetate	1.273
Isopropyl ether	0.429
Heptadecanol	0.312
Chloroform	0.178

OR

8. One thousand kilograms of a 30-wt% dioxane in water solution is to be treated with benzene at 25°C to remove 95% of the dioxane. The benzene is dioxane free, and the equilibrium distribution coefficient $K_{D,B}$ is 1.2. Calculate the solvent requirements for the following cascade configurations.
- a) A single batch extraction
 - b) Three crosscurrent stages using equal amounts of benzene
 - c) Two countercurrent stages.

16



9. a) 1200 ml of water has 144 grammes of glucose dissolved in it. If the solution is mixed with 500 grammes of virgin activated alumina, how much glucose will remain in solution when equilibrium has been reached ? **8**
- b) Discuss the process principles involved in PSA and TSA by giving suitable examples. What do mean by parametric pumping ? **10**

OR

10. It is required to extract picric acid from a dilute aqueous solution containing 0.1 mole picric acid per litre of solution using benzene as solvent with a recovery of 80% of the picric acid originally present. Determine the quantity of benzene required per litre of aqueous solution by employing

- a) single-stage extraction and
- b) three-stage extraction (crosscurrent) using equal amounts of fresh solvent in each stage. The equilibrium data for benzene-picric acid-water system at 25°C is given by,

$C_B \times 10^2$	0.0932	0.225	1	2	5	10	18
$m = \frac{C_B}{C_A}$	2.23	1.45	1.705	0.505	0.32	0.24	0.187

where, C_B and C_A are the equilibrium concentrations of picric acid in benzene and aqueous phases respectively in mole/litre.



11. a) Discuss in brief : NTU, HTU and HETP. **8**
- b) Discuss in brief the general design procedure for distillation column. **8**

OR

12. Write short notes on : **16**
- a) Reverse osmosis
- b) Tray Efficiency
- c) Extractive Distillation
- d) Types of Adsorption Isotherm.



[4063] – 12

T.E. (Mechanical) (Semester – I) Examination, 2011
HEAT TRANSFER
(2003 Course) (Common with Mech. S/W for Sem. – II)

Time : 3 Hours

Max. Marks : 100

- Instructions :** 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) Black 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

1. a) Derive expression for temperature distribution, under one dimensional steady state heat conduction for the following systems.
- i) Plane wall
 - ii) Cylinder
 - iii) Sphere. 9
- b) A surface having an area of 1.5 m^2 and maintained at 300°C exchanges heat by radiation with another surface at 40°C . The value of factor due to the geometric location and emissivity is 0.52. Determine :
- i) Heat lost by radiation,
 - ii) The value of thermal resistance, and
 - iii) The value of equivalent convection coefficient. 7

OR

2. a) Describe the mechanism of heat conduction. Define thermal diffusivity and discuss factors affecting it. Differentiate between isotropic and anisotropic materials giving one example of each. 8

P.T.O.



SECTION - II

7. a) Lubricating oil at a temperature of 60°C enters 1 cm diameter tube with a velocity of 3 m/s. The tube surface is maintained at 40°C . Assuming that the oil has the following average properties calculate the tube length required to cool the oil to 45°C . $\rho = 865 \text{ kg/m}^3$; $k = 0.14 \text{ W/mK}$; $c_p = 1.78 \text{ kJ/kgK}$. Assume flow to be laminar (and fully developed) $\text{Nu} = 3.657$. 8
- b) Differentiate between internal flow and external flow. 4
- c) Define Rayleigh's number and Grashoff number. 4

OR

8. a) A hot plate $1 \text{ m} \times 0.5 \text{ m}$ at 130°C is kept vertically in still air at 20°C . Find :
- i) Heat transfer coefficient
 - ii) Initial rate of cooling the plate in $^{\circ}\text{C}/\text{min}$.
 - iii) Time required for cooling plate from 180°C if the heat transfer is due to convection only. Mass of the plate is 20 kg and $c_p = 400 \text{ J/kgK}$. Assume 0.5 m side is vertical and that the heat transfer coefficient calculated in i) above remains constant and convection takes place from both sides of the plate. Take properties of air at 75°C as $c_p = 1000 \text{ J/kg}^{\circ}\text{C}$, $\rho = 1.07 \text{ m}^2/\text{s}$; $k = 0.029 \text{ J/kg K}$; $\nu = 19.1 \times 10^{-6} \text{ m}^2/\text{s}$. 8
- b) Explain with velocity and temperature distribution, the mechanism of natural convection heat transfer. 4
- c) Explain the term convective heat transfer coefficient and its relation with thermal boundary layer thickness. 4
9. a) Explain how the concepts of radiosity and irradiation are used to obtain surface resistance and space resistance. 4
- b) Derive and expression for Wien's displacement law. 6
- c) The effective temperature of a body having an area of 0.12 m^2 is 527°C . Calculate the following :
- i) The total rate of energy emission,
 - ii) The intensity if normal radiation, and
 - iii) The wavelength of maximum monochromatic emissive power. 6

OR



- b) Heat is conducted through a tapered circular rod of 200 mm length. The ends A and B having diameters 50 mm and 25 mm are maintained at 27°C and 227°C respectively. k (rod material) = $40 \text{ W/m}^{\circ}\text{C}$.

Find :

- i) Heat conducted through the rod
- ii) The temperature at the mid-point of the rod. Assume one dimensional steady state conduction.

8

3. Derive an expression for temperature distribution in plane wall under steady state heat conduction with heat generation for symmetrical and asymmetrical boundary condition.

16

OR

4. a) Discuss the effect of various parameters on the thermal conductivity of solids.

7

b) Write short notes on the following :

- i) Economic thickness of insulation.
- ii) Overall HTC.
- iii) Thermal contact resistance.

9

5. a) Derive an expression for instantaneous heat flow rate and total heat transfer under unsteady state heat conduction.

8

b) Derive an expression for estimation of error in temperature measurement in a thermometer well.

4

c) A mercury thermometer placed in oil well is required to measure temperature of compressed air flowing in a pipe. The well is 140 mm long and is made of steel ($k = 50 \text{ W/mK}$) of 1 mm thickness. The temperature recorded by the well is 100°C while pipe wall temperature is 50°C . HTC between the air and well wall is $30 \text{ W/m}^2\text{K}$. Estimate true temperature of air.

6

OR

6. a) Derive the formula for rate of heat transfer, efficiency and effectiveness for a infinitely long fin.

10

b) An egg with mean diameter of 40 mm and initially at 20°C is placed in a boiling water pan for 4 minutes and found to be boiled to the consumer's taste. For how long should a similar egg for same consumer be boiled when taken from a refrigerator at 5°C . Take the following properties for egg :

$k = 10 \text{ W/mK}$, $\rho = 1200 \text{ kg/m}^3$, $c = 2 \text{ kJ/kgK}$ and $h = 100 \text{ W/m}^2\text{K}$. Use lump theory.

8



10. a) Derive an expression for radiation shield. 8
- b) Calculate the net radiant heat exchange per m^2 area for two large parallel plates at temperatures of 427°C and 27°C respectively ϵ (hot plate) = 0.9 and ϵ (cold plate) = 0.6. If a polished aluminium shield is placed between them, find the % reduction in the heat transfer; ϵ (shield) = 0.4. 8
11. a) Derive an expression for effectiveness by NTU method for the counter flow heat exchanger. Hence derive an expression for condenser and evaporator and typical regenerators. 10
- b) A parallel flow heat exchanger has hot and cold water streams running through it and has the following data :
- $m_h = 10 \text{ kg/min}$; $m_c = 25 \text{ kg/min}$; $c_{ph} = c_{pc} = 4.18 \text{ kJ/kg}^\circ\text{C}$; $T_{hi} = 70^\circ\text{C}$; $T_{ho} = 50^\circ\text{C}$; $T_{ci} = 25^\circ\text{C}$. Individual HTC on both sides = $60 \text{ W/m}^2\text{C}$. Calculate the following :
- The area of the heat exchanger.
 - The exit temperatures of hot and cold fluids if hot water flow rate is doubled. 8

OR

12. a) Derive the expression for average heat transfer coefficient for laminar film condensation on a inclined plate. 10
- b) Classify boiling heat transfer with definition of each type. Differentiate between the mechanism of filmwise and dropwise condensation. 8



[4063] – 120

T.E. (Petrochemical) (Semester – II) Examination, 2011
PROCESS EQUIPMENT DESIGN
(2003 Course)

Time : 3 Hours

Max. Marks : 100

- Instructions :**
- 1) Answers 3 questions from *each* Section. *Que. 5 and Que. 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 table is **allowed.**
 - 6) Assume suitable data, if **necessary.**

SECTION – I

1. a) How stress concentration creates the unbalance in stress distribution in a material ? Discuss it with the help of few examples. **8**
- b) How equipment design is related to process design ? What is advantage of Chemical engineer over Mechanical engineer in terms of chemical equipment design ? **8**

OR

2. a) What will happen if proper codes and standards are not used for design of equipment ? What facility codes and standard provides to designer ? **8**
- b) How selection of material is very important in terms of design ? What is main criteria a designer should must follow while selection of material ? **8**
3. a) A flat belt is required to transmit 50 KW from a pulley of 2.0 M effective diameter running at 450 rpm. The angle of contact is spread over $1\frac{1}{24}$ of the circumference. The coefficient of friction between belt and pulley surface is 0.4. Determine taking centrifugal tension in account, Width of the belt required. If it is given that belt thickness is 9.0 mm, density of its material is 1100 kg/m^3 and related permissible working stress is 3.5 MPa. **10**

P.T.O.



b) The load on a member consists of an axial pull of 30 KN, with shear force of 15 KN, find the diameter of member according to :

6

- a) Maximum Normal Shear stress Theory
- b) Maximum Shear stress theory
- c) Maximum Principal Strain Theory
- d) Maximum Strain Energy theory.

OR

4. Design and draw a bushed pin type of flexible coupling to connect a motor shaft to a pump shaft, transmitting 32 KW at 960 rpm. The overall torque is 20% more than mean torque. The material properties are as follows :

A) The allowable shear and crushing stress for shaft and key material is 40 MPa and 80 MPa respectively.

B) The allowable shear stress for cast iron is 15 MPa.

C) The allowable bearing pressure for rubber bush is 0.8N/mm^2 .

D) The material of the pin is same as that of shaft and key. Diameter of pin may be increased for bending stresses. Brass bush thickness is 2 mm, whereas rubber bush is 6 mm thick. Enlarged portion in input flange is having 24 mm diameter. Clearance of 5 mm is left two halves of coupling.

16

5. a) 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 mm.

10

b) What do you mean by Factor of Safety ? What is its importance in designing pressure vessel. How the factor of safety does affects the thickness of vessel and ultimately the cost of vessel.

8



SECTION – II

6. A horizontal shell and tube heat exchanger is to be designed to condense 3.2 kg/sec. isobutane at 8.3 kg/cm². Water available at 25°C is to be used as a cooling medium and is to be used in other process unit at 37°C.

Tubes of 15 mm inside diameter and 2 mm wall thickness are available. The tubes are to be arranged on 25 mm square pitch. Tube length is 4.0 m.

Fouling resistance on each side may be assumed as 0.0004 m²K/w.

Latent heat of condensation at 8.3 kg/cm² = 275 kJ/kg. Condensation temperature of isobutane = 64°C.

What size of heat exchanger will be able to perform this duty ?

16

OR

7. A heat exchanger with installed heat transfer surface area of 8.1 m² is to be used for heating process liquor available at 16.5°C. The heating is to be performed with water available at 93°C from another part of the plant. The arrangement of the unit is such that the fluids flow in true counter current manner. The flow rates of the process liquor and water are 3.1 kg/sec and 1.1 kg/sec respectively. Previous experience indicates that an overall heat transfer coefficient of 450 W/m²K is suitable. Estimate the exit temperature of the two fluids and determine the effectiveness of the heat exchanger.

16

8. a) What are the different losses that can occur in storage tank ? Explain the breathing loss in details.

6

- b) Bottom plate of Circular Cylindrical Tank for storage of crude oil with conical roof.

Tank diameter = 20 m (Approx)

Tank height = 12 m (Approx)

Material carbon Steel with permissible stress = 142 N/mm²

Joint efficiency = 85%

Superimposed load = 1250 N/m²

Density = 7.7

Plate size available are

(6300 mm×1800 mm, 5000 mm ×2500 mm, 5600 mm × 1100 mm).

12

OR



9. Design a shell of circular cylindrical tank for storage of crude oil of 34° API.

Tank diameter = 16 m (Approx)

Tank Height = 12 m

Material mild steel with permissible stress = 90 N/mm²

Joint efficiency = 85%

Plate size available are (6300 mm×1800 mm, 5000 mm×2500 mm, 5600 mm×1100 mm) **18**

10. Write short notes on (**any four**) :

a) Pipeline Design considerations

b) ASME and TEMA CODES

c) Types of Agitator used in industry (With Neat Sketch)

d) Baffles and its need for mixing

e) Different Drives for agitators

f) Welded joints.

16



T.E. (Polymer Engg.) (Semester – I) Examination, 2011
MATHEMATICAL METHODS FOR POLYMER ENGINEERING
(2003 Course)

Time : 3 Hours

Max. Marks : 100

- Instructions :** 1) In Section I : Attempt Qu. 1 or Qu. 2, Qu.3 or Q. 4, Qu. 5 or Qu. 6. In Section II : Attempt Qu. 7 or Qu.8 Qu. 9 or Qu. 10, Qu. 11 or Qu. 12.
- 2) Answers to the **two** sections should be written in **separate** books.
- 3) **Neat** diagrams must be drawn **wherever** necessary.
- 4) Black figures to the **right** indicate **full** marks.
- 5) Use of electronic pocket calculator is **allowed**.
- 6) Assume suitable data, **if necessary**.

SECTION – I

- 1) a) Establish the following results

i) $(1 + \Delta)(1 - \nabla) = 1$ ii) $\Delta = \mu\delta + \frac{1}{2}\delta^2$ iii) $\delta = E^{1/2}\nabla = E^{-1/2}\Delta$. **9**

- b) Construct the forward difference table for $y = \tan x$, $x=10^\circ(5^\circ) 35^\circ$ and find $\tan 12.5^\circ$ and $\text{Sec}^2 12.5^\circ$ using forward difference formulae. **8**

OR

2. a) Use Regula-Falsi method to find real root of the equation $e^x - 4x = 0$, correct to three decimal places. Write the algorithm for the above method. **9**

- b) Use Newton-Raphson method to find the root of the equation $\tan x = x$, correct to four decimal places. Take initial approximation as $x_0 = \frac{3\pi}{2}$.

Write the algorithm for the above method. **8**

3. a) Use Trapezoidal rule to evaluate $I = \int_0^1 x e^{x^2} dx$, taking $h = 0.1$. **8**

- b) Use modified Euler's method to solve $\frac{dy}{dx} = 1 + xy$, with $y(0)=1$ to calculate y at $x = 0.1$, $x = 0.2$ and $x = 0.3$. **9**

OR

P.T.O.



4. a) Use Simpson's $\frac{1}{3}$ rd rule to evaluate $\int_0^{\pi/2} \frac{\sin x}{x} dx$, by dividing the interval into six parts. 8

b) Solve the equation $\frac{dy}{dx} = \sqrt{x+y}$, $x=0, y=1$, using Runge-Kutta method to find y at $x=0.4$, taking $h=0.2$. 9

5. a) Solve the system of equations by Gauss-seidel method.

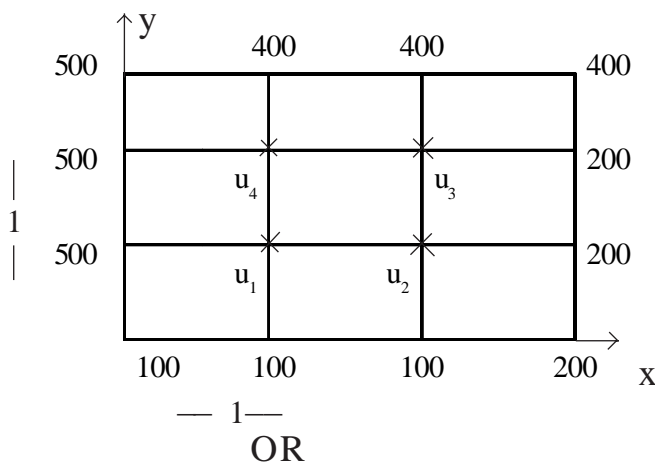
$$10x_1 + x_2 + x_3 = 12$$

$$2x_1 + 10x_2 + x_3 = 13$$

$$2x_1 + 2x_2 + 10x_3 = 14$$

8

b) Solve the equation $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$ for the pivotal values of the grid shown in the figure. 8



6. a) Using explicit finite difference scheme, solve the equation $\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2}$ 8

subject to the conditions

$$u(0, t) = 0, u(1, t) = 0$$

$$u(x, 0) = \sin \pi x \quad 0 \leq x \leq 1$$

take $\delta x = 0.1, \delta t = 0.001$ find u at $t=0.001$ and $t=0.002$ at the nodal points.



- b) Using method of least squares, fit a parabola of the form $y = ax^2 + bx + c$ to the following data

x	0	1	2	3	4	5	6
y	1	-1	-1	1	5	11	19

8

SECTION – II

7. a) Calculate the Arithmetic mean and standard deviation of the following frequency distribution.

x	1	2	3	4	5	6
f	3	4	8	6	4	2

8

Find also the coefficient of variation.

- b) The first four moments of a distribution about the value 5 are 2,20,40 and 50. Find the first four moments about the mean and coefficients of skewness and kurtosis.

8

OR

8. a) Five boys and five girls are to be seated in a row. In how many ways can they be seated if
 i) all boys must be seated in the five left-most seats.
 ii) no two boys can be seated together.

4

- b) Two cards are drawn from a well shuffled pack of 52 cards. Find the probability that they are both kings if
 i) The first card drawn is replaced
 ii) The first card drawn is not replaced.

4

- c) Find the lines of regression for the following data :

x	10	14	19	26	30	34	39
y	12	16	18	26	29	35	38

8

Estimate y for x = 15.5

9. a) Probability of man aged 70 years will live for 80 years is $\frac{1}{10}$. Find the probability of 5 men selected at random 2 will live for 80 years.
 b) In a certain factory producing razor blades, there is a small chance of $\frac{1}{500}$ for any blade to be defective. The blades are supplied in a packet of 10. Use Poisson distribution to calculate the approximate number of packets containing no defective blades and two defective blades, in a consignment of 10,000 packets.

5

6



- c) The mean weight of 500 students is 63 kgs. and the standard deviation is 8 kgs. Assuming that the weights are normally distributed, find how many weigh 52 kgs ? The weights are recorded to the nearest kg.

$[z_1 = 1.31, A_1 = 0.4049; z_2 = 1.44, A_2 = 0.4251]$. 6

OR

10. a) The figures given below are (a) the theoretical frequencies of a distribution and (b) the frequencies of a normal distribution having the same mean, standard deviation and the total frequency as in (a)

a)	1	5	20	28	42	22	15	5	2
b)	1	6	18	25	40	25	18	6	1.

Apply the χ^2 test of goodness of fit $[\chi^2_{6;0.05} = 12.592]$. 6

- b) In a Poisson distribution if $p(r = 1) = 2 p(r = 2)$ Find $p(r = 3)$ and $p(r = 4)$. 5
 c) Find the unique fixed probability vector \bar{t} of the regular stochastic matrix. 5

$$P = \begin{bmatrix} 0 & \frac{1}{2} & \frac{1}{2} \\ \frac{1}{3} & \frac{2}{3} & 0 \\ 0 & 1 & 0 \end{bmatrix}$$
6

11. a) Show that $\frac{\partial A_p}{\partial x^q}$ is not a tensor, even though A_p is a covariant tensor of rank one. 5

b) If A_r^{pq} and B_t^s are tensors, prove that $A_r^{pq} B_t^s$ is also a tensor. 6

c) A covariant tensor has components xy, yz, zx in Cartesian system. Find its covariant components in cylindrical system. 6

OR

12. a) Determine the conjugate metric tensor in
 i) Cylindrical coordinates ii) Spherical polar coordinates. 6

b) Prove that $[pq, r] = g_{rs} \begin{Bmatrix} s \\ pq \end{Bmatrix}$. 6

c) A covariant tensor has components x^2, xy in two dimensional rectangular system. Find its covariant components in polar system. 5



[4063] – 122

T.E. (Polymer Engineering) (Semester – I) Examination, 2011
POLYMER CHEMISTRY – I
(2003 Course)

Time : 3 Hours

Max. Marks : 100

- Instructions:* 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

1. a) Classify the polymers based on thermal behaviour and arrangement of monomers in the chain. 8
- b) Derive Carother's equation and give its importance. 8
- OR
- a) Explain with suitable examples IUPAC nomenclature of polymers. 8
- b) Define and explain with suitable examples 8
- a) Oligomer
- b) Heterochain polymer.
2. a) Write a note on weight average and sedimentation average molecular weight. 8
- b) Explain end group analysis to determine molecular weight. 9
- OR
- a) Write a note on various average molecular weights in polymer. 8
- b) Discuss molecular weight determination by ebulliometry. 9

P.T.O.



3. a) Explain how precipitation of polymer can be utilized to determine MWD. 8
b) Define polydispersity. Draw a curve showing the position of various average MWs. 9

OR

- a) Discuss sedimentation velocity method. 8
b) Explain GPC in detail. 9

SECTION – II

4. a) Discuss melt polycondensation technique. 8
b) Discuss gas phase polymerization. 8

OR

- a) Compare solution and suspension polymerization technique. 8
b) Write a note on phase transfer catalyst. 8

5. a) Discuss cationic polymerization mechanism in detail. 8
b) Write a note on initiators in anionic polymerization. 9

OR

- a) Explain anionic polymerization mechanism in detail. 8
b) Write a note on initiators in cationic polymerization. 9

6. a) Give the mechanism for polymerization of ϵ' -caprolactum. 8
b) What is polyaddition polymerization ? 9

OR

- a) Write a note on stoichiometry. 8
b) Discuss gelation and explain how to determine extent of the same. 9



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T.E. (Polymer) (Semester – I) Examination, 2011
POLYMER MATERIALS – I
(2003 Course)

Time : 3 Hours

Max. Marks : 100

- Instructions :** 1) Answer **any 3** questions from **each** Section.
2) Answer **3** questions from Section – I and **3** questions from Section – II.
3) Black 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

1. a) Differentiate between commodity, engineering and high performance plastics and classify the below given polymers according to the classification above. **6**
- | | |
|----------------|--------------|
| 1) PEEK | 2) Nylon 6,6 |
| 3) Polyacetals | 4) PVC. |
| 5) PET | |
- b) State the modified forms of Polystyrene. How is high impact polystyrene prepared ? Give 2 applications where it finds usage. **6**
- c) Discuss “K-value” with respect to PVC ? **4**

OR

2. a) What are the points to be ensured while extruding plasticised PVC or what are the stages involved while melt processing plasticised PVC. **6**
- b) State a few properties of isolactic polypropylene. **4**
- c) What is ‘ABS’ ? How is it prepared ? What are the ways adopted to improve flame -retardancy in ABS ? **6**

P.T.O.



[4063] – 125

T.E. (Semester – I) (Polymer) Examination, 2011
DESIGN OF EQUIPMENT AND MACHINE ELEMENTS
(2003 Course)

Time : 3 Hours

Max. Marks : 100

- Instructions :** 1) Attempt Q. No. 1 or 2, Q. No. 3 or 4 and Question No. 5 or 6 from Section I. Attempt Question 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 **two separate** answer sheets.
- 3) Figures to the **right** indicate **full** marks..
- 4) **Use** of scientific calculator, log paper is **allowed**.
- 5) Assume suitable design data if **required**.

SECTION – I

1. a) Write short note on copper and copper alloys. Give BIS designations. **6**
- b) Draw Mohr's circle and calculate principle stresses for the following conditions.
- $\sigma_x = 60$ MPa
 $\sigma_y = 30$ MPa
 $\tau_{xy} = 20$ MPa
- Calculate maximum shear stress as well. **6**
- c) Explain any four important properties of the metals. **4**
2. a) A wrought iron bar 60 mm in diameter and 2 meter long transmits shock energy of 100 N.m. Find maximum instantaneous stress and elongation. Take $E = 200$ GN/m². **4**
- b) Discuss maximum shear stress theory for biaxial stress system. **4**
- c) A mild steel shaft 100 mm in diameter is subjected to bending moment of 2000 N.M. and torque 'T'. If yield point of steel in tension is 200 MPa, find maximum value of torque without causing yielding of the shaft according to
- i) maximum distortion energy theory
- ii) maximum principle stress theory. **8**

P.T.O.



3. a) Derive an equation for obtaining shaft diameter subjected to
i) bending only
ii) torsion only. **6**
- b) Draw a neat sketch of bushed pin coupling and explain the design procedure for designing various parts of the coupling. **8**
- c) Discuss use and application of Woodruff key. **2**
- d) State difference between rigid and flexible couplings. **2**
4. a) Show that square key is equally strong in shearing and crushing. **6**
- b) Obtain an expression for finding out root diameter of bolts in case of clamp or compression or split muff coupling. **6**
- c) A shaft supported at ends carry a straight tooth spur gear at its mid span. The system transmits 5 KW at 200 rpm. The distance between bearings is 200 mm. The pitch circle diameter of gear is 150 mm. Determine the diameter of shaft.
- Take allowable shear stress for shaft as 45 MPa and pressure angle for gear as 20° . **6**
5. a) Discuss Lewis equation for strength of gear tooth. **4**
- b) Give comparison between involute and cycloidal gears. **4**
- c) Draw a neat sketch of Plummer Block. Give design procedure for design of bearing cap and bolts. **8**
6. a) Write in short about :
i) Critical pressure of journal bearing
ii) Reliability of bearing
iii) Dynamic equivalent load for rolling contact bearing. **9**
- b) Write in short about dynamic tooth load. **4**
- c) Draw neat sketch of single or double direction thrust ball bearing. **3**



SECTION – II

7. a) Draw a neat sketch of deceleration valve and explain the functioning of the valve. **6**
- b) Give symbol of :
- i) Spring centered three position 4 way (all ports blocked) type of directional control valve.
- ii) Any one type of two position actuate to center type of directional control valve. **6**
- c) Draw a neat sketch of pressure compensated, restrictor type flow control valve and explain the functioning of the valve. **6**
8. a) Draw a hydraulic circuit showing meter-in meter-out and bleed of type of flow control principle using linear actuator. **4**
- b) Draw a hydraulic circuit showing accumulator bleed-off circuit and explain the functioning. **4**
- c) Draw a neat sketch of balanced piston relief valve and explain the venting of the valve. **6**
- d) Explain operation of traverse and feed circuit with the help of neat sketch. **4**
9. a) Draw a hydraulic circuit showing injection unit forward and backward operation. **4**
- b) Draw a hydraulic circuit showing typical decompression of clamp force in case of direct locking hydraulic machine. **4**
- c) Explain any one type of lock and block type of clamping mechanism and discuss the merits of design. **8**
10. a) Explain merits and demerits of toggle type, direct locking hydraulic and hydro-mechanical type of injection moulding machines. **9**
- b) Explain the concept of mould safety (high and low). If required draw hydraulic circuit showing these features. **7**



11. a) A cylindrical vessel is provided with a conical head having base diameter 240 cm Half, apex angle is 45° and design pressure of the vessel is 1.5 kg/cm^2 . Permissible stress in the vessel is 1400 kg/cm^2 . Calculate the thickness of the head. **8**
- b) A cylindrical pressure with 2.5 m internal diameter is to be operated at 4 kg/cm^2 . The permissible stress in the material is 980 kg/cm^2 . Take welded joint efficiency as 85 %. Calculate the thickness of the vessel. If the same vessel is to be fabricated in spherical form, what is the maximum pressure it will be able to withstand ? **8**
12. a) Write a note on :
- i) Factor of safety and corrosion allowance in pressure vessels. **8**
 - ii) Nozzle reinforcement procedure. **8**
- b) Sketch and explain the design procedure for various different types of heads used in pressure vessels. **8**



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T.E. (Polymer Engineering) (Semester – II) Examination, 2011
POLYMER CHEMISTRY – II
(2003 Course)

Time : 3 Hours

Max. Marks : 100

- Instructions :* 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

1. a) Discuss the polymer dissolution process in detail. 8
b) Explain how crystalline and amorphous regions respond to dissolution. 9

OR

1. a) Write a note on photodegradation. 8
b) Write a note on thermal degradation. 9
2. a) Discuss types of isomerism in polymers. 8
b) Explain ditacticity in polymers with suitable illustrations. 9

OR

2. a) Explain how ZN polymerization gives stereoregular polymers. 8
b) Write a note on zirconocene catalyst. Explain its working mechanism. 9
3. a) Define copolymerization. Explain synthesis of star copolymers. 8
b) Write a note on Q-e scheme. 8

OR

3. a) Discuss and differentiate cationic and anionic copolymerization. 8
b) Give examples of commercial copolymers based on any two polymers. 8

P.T.O.



SECTION – II

4. a) Differentiate resol and novolac w.r.t. their synthesis, properties and applications. 8
b) Give the properties and applications of silicone resin. 9

OR

4. a) Give the paint resin formulation for unsaturated polyester resin. 8
b) Give the synthesis and curing of polyurethane resin. 9

5. a) Discuss the following polymer reactions and give at least one importance of each of them.

- i) Addition reaction. 6
ii) Substitution reaction. 6
iii) Aminolysis. 5

OR

5. a) Explain in detail the following reactions and their commercial use.
i) Hydroxyl group reactions. 6
ii) Aldehyde group reactions. 6
iii) Reaction involving ketone. 5

6. a) Derive the kinetic expression for anionic polymerization. 8
b) Explain the kinetics of cationic chain polymerization. 8

OR

6. a) Differentiate between the kinetics of homo and copolymerization. 8
b) Discuss the kinetic equation for acid catalyzed polycondensation. 8



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T.E. (Semester – II) (Polymer Engineering) Examination, 2011
INSTRUMENTATION AND PROCESS CONTROL
(2003 Course)

Time : 3 Hours

Max. Marks : 100

- Instructions :** 1) Answers to the Sections should be written in *separate* books.
2) Draw *neat* diagrams *wherever* necessary.
3) Numbers to the *right* indicate *full* marks.
4) *Assume* suitable data, if *necessary*.
5) *Use* of logarithmic table, electronic pocket calculators is *allowed*.

SECTION – I

1. a) Explain the following terms in brief : Accuracy, Repeatability, Sensitivity, and Range. 8
b) Describe the calibration term and how to calibrate temperature measurement system ? 10
OR
2. a) Define term ‘Measuring Instruments’ and write short note on ‘classification of instruments’. 8
b) Discuss different dynamic characteristics of measuring instrument and also discuss the importance of the same. 10
3. a) Explain with neat diagram, principle, construction, working, merits and demerits of radiation pyrometers. 10
b) Discuss in brief classification of the methods of pressure measurement. 6
OR
4. a) Explain with neat diagram, principle, construction, working, merits and demerits of strain gauge pressure transducer. 10
b) Discuss in brief classification of the methods of temperature measurement. 6
5. a) With a neat sketch explain construction, working, advantages and disadvantages of variable area flow meter. 10
b) Write short-note on viscosity measurement. 6
OR
6. With a neat sketch explain construction, working, merits, demerits and applications of ultrasonic level detectors. 16

P.T.O.



SECTION – II

7. a) Discuss the objectives of process control. Differentiate between Manual Vs Automatic Control Operations. **8**
- b) Discuss the transient Response of First Order System for Impulse forcing function. **10**
- OR
8. a) Discuss the transfer function of first order system with one example. **10**
- b) Write a note on the response of interacting system. **8**
9. a) Explain the following terms : **8**
- i) Controller
 - ii) Manipulated variable
 - iii) Controlled variable
 - iv) Set point
- b) Explain the standard block diagram representation applicable for feedback control system with one example. **8**
- OR
10. a) Derive the overall transfer function applicable for closed loop control system. **8**
- b) Discuss the response of control system showing the effects of various modes of control **8**
- i) None
 - ii) Proportional (P)
 - iii) Proportional Integral (PI)
 - iv) Proportional Integral Derivative (PID)
11. a) Discuss the importance of process control in manufacturing of polymer. **8**
- b) Discuss any one example of PC based control system. **8**
- OR
12. Discuss the effect of proportional, integral, derivative control action. Discuss the single input single output (SISO) and multiple input multiple output (MIMO) feedback control system. **16**



**T.E. (Semester – I) (Mech.) Examination, 2011
(2003 Course)**

THEORY OF MACHINES AND MECHANISMS – II

Time : 3 Hours

Max. Marks : 100

Instructions : 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 electronic pocket calculator is **allowed**.

5) Assume suitable data, **if necessary**.

SECTION – I

1. a) Explain the terms friction circle friction couple and friction axis. **6**
- b) Prove that efficiency of self locking power screw is less than 50%. **4**
- c) The mean diameter of a whit worth bolt is 25 mm. The pitch of the thread is 5 mm and angle of v is 55° . The bolt is tightened by screwing a nut whose mean radius of bearing surface is 25 mm. If coefficient of friction for nut and bolt is 0.1 and for nut and bearing surface is 0.16, find the force required at the end of spanner 0.5 m long when the load on the bolt is 8 kN. **6**

OR

2. a) Derive an expression for velocity ratio considering slip and belt thickness. **6**
- b) Determine the width of a 9.75 mm thick leather belt required to transmit 15 kW from a motor running at 900 rpm. The diameter of the driving pulley of the motor is 300 mm. The driven pulley runs at 300 rpm. The distance between the centre of two pulleys is 3 m. The density of belt material is 1000 Kg/m^3 . The maximum allowable stress in leather is 2.5 MPa. The coefficient of friction between leather belt and pulley is 0.3. Assume open belt drive and neglect effect of slag and slip of the belt. Also calculate speed of belt for maximum power transmission. **10**
3. a) Derive an expression for frictional torque for truncated conical pivot collar under uniform pressure condition. Also explain the term virtual coefficient of friction. **8**

P.T.O.



- b) The hand operated brake shown in Fig. (1) is fitted to a shaft carrying a flywheel of mass 400 Kg with a radius of gyration 45 cm running at 360 rpm. Determine :

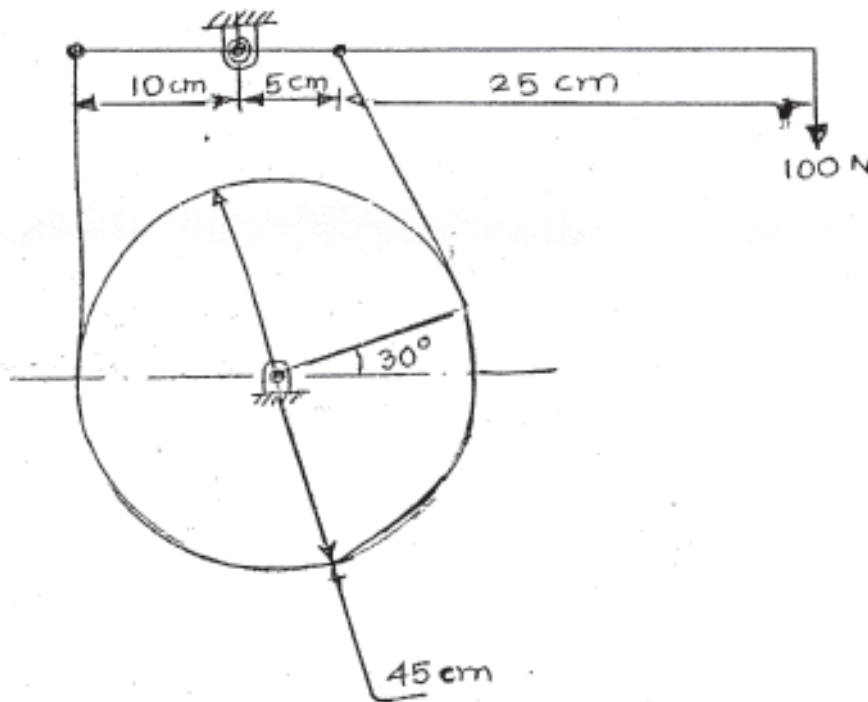


Fig. 1

- i) Torque applied due to pull of 100 N
- ii) Number of revolutions of the flywheel before it is brought to rest
- iii) The time required to bring the wheel to rest

Take coefficient of friction 0.2.

OR



4. a) A centrifugal clutch transmits 15 kW power at 900 rpm. The shoes are four in number and engages with the drum at 75% of running speed of input shaft. The inner radius of drum is 15 cm and the radial distance of centre of gravity of shoe from centre of rotation of spider in engaged position is 12 cm. Take coefficient of friction as 0.25 and maximum permissible pressure intensity as 0.1 N/mm^2 . Determine :
- i) mass of each shoe
 - ii) size of the shoes if angle subtended by the shoes at the centre of the spider is 60° . **8**
- b) Explain principle and working of Bavis-Gibson Torsion dynamometer with neat sketch. **8**
5. a) An eccentric cam has diameter of disc 80 mm and an offset 30 mm from centre of rotation, operates a flat faced follower. Follower is inline with cam and has a mass 2.5 kg. A spring stiffness is 4 N/mm maintains contact between cam and follower. In the lowest position the spring force is 45 N. Determine speed of camshaft when follower starts lifting. **8**
- b) What is polynomial cam ? Where it is used ? **4**
- c) Draw a neat sketch of cam and follower stating the terminology and define the terms : **6**
- i) Pressure angle
 - ii) Pitch point
 - iii) Pitch curve
 - iv) Prime circle

OR



6. The following data relate to a cam profile which operates a roller follower rising with cycloidal motion and lowering with uniform acceleration retardation.

Minimum radius of cam = 30 mm

Radius of roller = 10 mm

Lift of follower = 45 mm

Offset of follower axis = 12 mm towards left

Angle of ascent = 70°

Angle of descent = 120°

Angle of dwell in highest position of follower = 45°

Speed of cam = 200 rpm

Draw the profile of the cam and determine the maximum velocity and acceleration during the lift and return of follower. Also comment on where this cam profile can be used.

18

SECTION – II

7. a) Explain the need of flywheel for different I.C. engines. Comment on sizes of flywheels required in various I.C. Engines.

6

- b) Each arm of a porter governor is 250 mm long. The upper and lower arms are pivoted to links of 40 mm and 50 mm respectively from the axis of rotation. Each belt has a mass of 5 kg and the sleeve mass is 50 kg. The force of friction on the sleeve of the mechanism is 40 N. Determine the range of speed of the governor for extreme radii of rotation of 125 mm and 150 mm.

10

OR



8. a) Explain the principle of inertia governor. 4
- b) The torque delivered by a two-stroke engine is represented by
 $T = (1000 + 300 \sin 2\theta - 500 \cos 2\theta)$ Nm. The engine speed is 250 rpm. The mass of the flywheel is 400 kg and radius of gyration 400 mm. Determine :
- i) Power developed.
 - ii) Total percentage fluctuation of speed.
 - iii) Angular acceleration of flywheel when the crank has rotated through an angle of 60° from IDC.
 - iv) Maximum angular acceleration and retardation of the flywheel. 12
9. a) Obtain an expression for the virtual number of teeth for a helical gear. 4
- b) Two 20° involute spur gears in mesh have a module 8 mm. The larger gear has 57 teeth while the pinion has 23 teeth. If the addenda on pinion and gear wheel are equal to one module find :
- i) The number of pairs of teeth in contact.
 - ii) Angle of action of pinion and gear wheel.
 - iii) The ratio of sliding velocity to rolling velocity at the beginning of contact, at pitch point and at the end of contact. 12

OR



10. a) Explain methods to avoid interference in involute gears. 6
- b) Explain law of gearing and obtain the mathematical condition. 6
- c) Explain with neat sketch forces acting on the pitch cylinders of a helical gear pair in mesh. 4
11. a) Derive an equation for efficiency of spiral gears. 6
- b) In an epicyclic gear train, shown in fig. (2), a gear C, which has teeth cut internally and externally is free to rotate on an arm driven by shaft S_1 . It meshes externally with the casing, D and internally with the pinion B. The gears have following number of teeth :

$$T_B = 24, T_C = 32 \text{ and } T_D = 48.$$

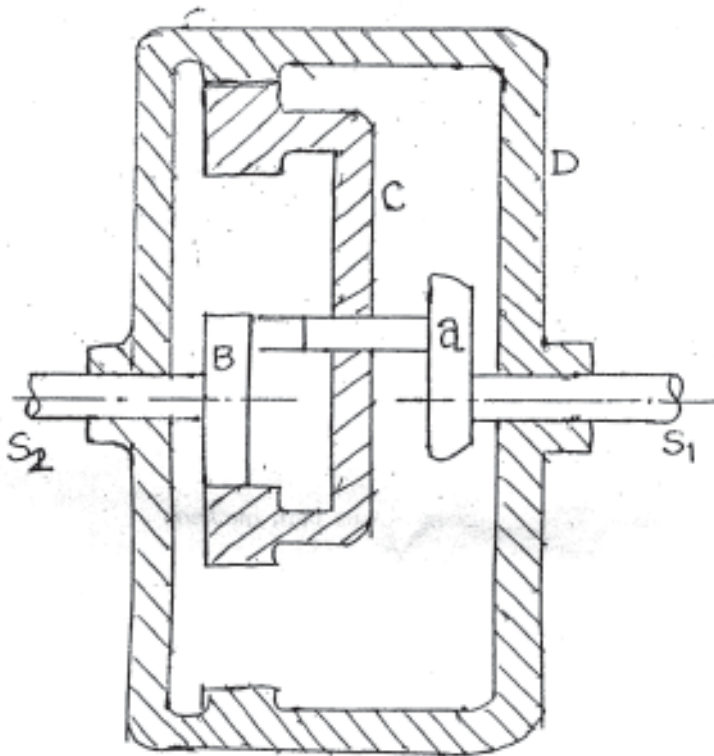


Fig. 2



Find the velocity ratio between :

- i) S_1 and S_2 when D is fixed
- ii) S_1 and D when S_2 is fixed.

What will be the torque required to fix the casing D, if a torque of 300 Nm is applied to the shaft S_1 .

12

OR

12. a) Explain with application a reverted gear train. **4**
- b) Explain with neat sketch and tabular method, working of differential gear box. **6**
- c) The centre distance between two meshing spiral gears is 260 mm and the angle between the shafts 65° . The normal circular pitch is 14 mm and the gear ratio is 2.5. The driven gear has a helix angle of 35° , Find :
- i) Number of teeth on each wheel
 - ii) Exact centre distance
 - iii) Efficiency assuming the friction angle to be 5.5° . **8**



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T.E. (Polymer) (Semester – II) Examination, 2011
POLYMER RHEOLOGY AND PROCESSING
(2003 Course)

Time : 3 Hours

Max. Marks : 100

- Instructions :** 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) Black figures to the **right** indicate **full** marks.
5) Your answers will be valued as a whole.
6) **Assume** suitable data, if necessary.

SECTION – I

1. a) Explain Newtonian and Non-Newtonian fluids with their classifications. Also explain the nature of polymer from that classification. **9**
b) Explain following terms : **9**
i) Creep
ii) Melt fracture
iii) Creep compliance.
OR
2. a) Give any one mechanical model with its derivation to explain how it correlates to polymeric behaviour. **9**
b) Explain following terms : **9**
i) Normal stress
ii) Isochronous stress strain plot
iii) Storage and loss modulus.
3. a) Explain what is superimposed pressure flow and superimposed extensional flow during shear flow. **8**
b) Explain 2 corrections for capillary rheometer. **8**
OR
4. a) Explain different types of torque rheometer. **8**
b) For flow of polymer through circular c/s, derive shear stress and shear rate equation. **8**

P.T.O.



5. a) What is the significance of tensor notations ? What are the two subscripts giving information ? Also explain why vectors cannot describe rheology. **8**
- b) Give one eg. of simple shear and one of simple extension with help of tensor notation. **8**

OR

6. a) What is continuity equation used for and show how it is derived ? **8**
- b) Explain how storage and loss modulus can be found and what is the significance of both. **8**

SECTION – II

7. a) Explain single screw geometry with proper diagram. Also explain how it changes for few polymer and justify. **10**
- b) Explain drive types of an extruder. **8**

OR

8. a) Explain the mechanism of vented screw with diagram. **6**
- b) Explain the mechanism of mixing screw with diagram. **6**
- c) Explain the flow of material through screw and also give the influence of thermal heat generated during the flow process. **6**
9. a) Give comparison between injection molding of elastomer and thermoplastics. **10**
- b) During injection molding what are the processing parameters that are required to be paid attention to ? **6**

OR

10. a) Give the significance of PVT diagram and explain injection molding cycle. **8**
- b) Draw a cycle time chart for injection molding for a sequential m/c. **8**
11. a) Explain the role played by channel depth during single screw extrusion. **8**
- b) Explain the die characteristics of an extruder during processing. **8**

OR

12. a) Derive an expression for pressure flow in a single screw extruder. **8**
- b) How to estimate output and power requirement in a single screw extruder ? **8**



[4063] – 131

**T.E. (Comp./I.T.) (Semester – I) Examination, 2011
DATABASE MANAGEMENT SYSTEMS
(2003 Course)**

Time : 3 Hours

Max. Marks :100

- Instructions :** 1) Answers to the **two** Sections should be written in **separate** books.
2) **Neat** diagrams must be drawn **wherever** necessary.
3) **Black** figures to the **right** indicate **full** marks.
4) **Assume** suitable data, if **necessary**.

SECTION – I

1. A) A reputed general hospital has decided to computerize their operations. In the hospital many doctors are working. Personal information of doctors are maintained to get them fixed salary per month. The patients are admitted to the hospital into the room. They are treated by various doctors. Sometimes patients perform certain pathological tests which carried out into the labs. 8
- i) Identify all entities.
ii) Identify all relations and connectivities among entities.
iii) Draw E-R diagram.
- B) What is meant by mapping cardinality ? For a binary relationship set what are the possible mapping cardinalities ? 4
- C) Specify CODD's norms to be satisfied by RDBMS. 6
- OR
2. A) Explain with an example how E-R diagrams are converted into tables. 6
- B) Explain the distinction between the following : 4
- i) Condition-defined and user-defined design constraints.
ii) Disjoint and overlapping design constraints.
- C) Explain various components of DBMS with neat sketch. 8
3. A) Explain with example referential integrity. Also discuss the situations when referential integrity constraint is getting violated by insert, delete and update operations on the relation. 8
- B) Describe the concept of cursor and how it is used in embedded SQL. Explain various commands used in embedded SQL. 8

OR

P.T.O.



4. A) Let $R = (A, B, C)$ and let r_1 and r_2 both be relations on schema R . Give an expression in SQL that is equivalent to each of the following queries. 8
- i) $r_1 \cup r_2$ ii) $r_1 \cap r_2$
 iii) $r_1 - r_2$ iv) $\pi_{AB}(r_1) \bowtie \pi_{BC}(r_2)$

B) What is view in SQL and how it is defined ? Explain with example update operation in a view. 6

C) Show that, in SQL $< >$ **all** is identical to **not in**. 2

5. A) Define Boyce-Codd normal form. How does it differ from 3NF ? Why is it considered a stronger form of 3NF ? 8

B) Why are certain functional dependencies called trivial functional dependencies ? 2

C) Which are different fact finding techniques ? State advantages and disadvantages of each. 6

OR

6. A) For a relation schema $R = (A, B, C, G, H, I)$, Compute the closure F^+ of the following set F of functional dependencies. Also compute canonical cover F_c . 8

$$F = (A \rightarrow B, A \rightarrow C, CG \rightarrow H, CG \rightarrow I, B \rightarrow H)$$

B) Rewrite the definitions of 4NF and BCNF using the notions of domain constraints and general constraints. 8

SECTION – II

7. A) What is index ? How it is used to speed up database retrieval ? Explain different types of index. 10

B) Explain basic steps involved in query processing. What is the role of relational algebra in query processing ? 8

OR

8. A) What are the reasons for having variable length records ? Explain implementation of variable length record using fixed-length representation in detail. 10

B) Explain insertion operation on B^+ -trees with suitable example. 8



9. A) When do deadlocks happen, how to prevent them and how to recover if deadlock takes place ? **8**
B) State ACID properties of transaction. Explain implementation of any two of them. **8**
OR
10. A) Explain two phase locking protocol. How does it ensure serializability ? **8**
B) Which are different crash-recovery methods ? Explain any one in detail. **8**
11. A) Explain in detail ODMG language constructs for object definition and object manipulation. **8**
B) Explain advantages and disadvantages of distributed database systems. **8**
OR
12. A) Explain the various issues that decide the time cost of communication between client and server. **8**
B) Explain how objects are stored in relational databases. **8**
-



[4063] – 132

**T.E. (Computer) (Semester – I) Examination, 2011
DATA COMMUNICATIONS (2003 Course)**

Time : 3 Hours

Max. Marks : 100

- Instructions :*
- Answer **any three** questions from **each** Section.
 - Answers to the **two** Sections should be written in **separate** books.
 - Neat** diagrams must be drawn **wherever** necessary.
 - Figures to the **right** indicate **full** marks.
 - Assume **suitable** data, **if** necessary.

SECTION – 1

- Explain Quadrature Amplitude Modulation (QAM). What are its advantages ? **8**
 - Explain in short the need of Pre-emphasis and De-emphasis. **4**
 - Explain with neat block diagram the SSB generation using phase shift method. **6**

OR

- Explain in short the concept behind Vestigial Sideband Modulation (VSB) along with its suitable application. **6**
 - Draw and explain the frequency spectrum of AM wave. Also explain modulation index and bandwidth of AM wave with suitable example. **8**
 - A 10 kW carrier wave is amplitude modulated at 80 % depth of modulation by a sinusoidal modulating signal. Calculate the sideband power, total power and the transmission efficiency of AM wave. **4**
- Explain in short what is PWM and PAM along with its advantages. **6**
 - Explain what is aliasing effect ? How to overcome it ? **6**
 - Explain the sampling theorem. Comment on the effect of sampling Frequency on reconstruction of the signal. **4**

OR

P.T.O.



4. a) Describe NRZ, NRZI, Manchester and Differential Manchester line coding technique with suitable example. **8**
- b) Differentiate between Ideal sampling and Flat top sampling. **4**
- c) Explain what is Crosstalk and Guard Time. **4**
5. a) What is the significance of Quantization in A/D Conversion ? What is Uniform Quantization ? What is the drawback associated with it and how to overcome this drawback. **10**
- b) A signal $m(t)$ of Bandwidth $B = 4$ KHz is transmitted using a binary companded PCM with $\mu = 100$. Compare the case of $L = 64$ with the case of $L = 256$ from the point of view of transmission bandwidth and the output SNR. **6**

OR

6. a) Explain in detail delta modulation system. Draw diagram for Delta transmitter and receiver. What are its advantages over PCM ? **10**
- b) What is the concept of Digital Hierarchy ? Explain how many voice channels are supported by T1 and E1 carriers ? What is the total data rate supported by each of them ? **6**

SECTION – 2

7. a) Describe the following terms :
- i) Hamming weight of a code word.
 - ii) Hamming distance
 - iii) Code efficiency
 - iv) Entropy and Information rate. **8**
- b) What is the significance of Entropy ? How mathematically it is expressed ? **4**
- c) Using Shannon's theorem compute the maximum bit rate for a channel having bandwidth 3100Hz and a signal to noise ratio 20dB. **4**

OR



8. a) Explain the concept of Sliding window protocol. What are its advantages over Stop and wait approach ? **8**
- b) What is CRC ? Compute the polynomial checksum for a Frame 1101011011 using the generator $G(x) = x^4 + x + 1$. **8**
9. a) Comment on the significance of the various channels used in ISDN ? Also specify the data rate supported by these channels. **6**
- b) Draw and explain the ATM cell Header Structure. **6**
- c) Draw and explain the B-ISDN protocol architecture. Which layers are similar to the ATM protocol architecture ? **6**
- OR
10. a) Write a short note on Frame Relay Technology. **6**
- b) Comment on NT1, NT2 and TA functional groups of ISDN. **6**
- c) Describe in short the need of AAL. Explain AAL Type 1. **6**
11. a) Draw the TCP/IP protocol Stack. Comment on the functions of IP, TCP and UDP protocols. **8**
- b) Explain in short various physical topologies. Which topology is widely used today and why ? **8**
- OR
12. a) Draw and explain the Ethernet frame format. What is the maximum data that can be carried in an Ethernet frame ? **8**
- b) Comment on the various physical cable medium options available along with their supported data rates. **8**



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**T.E. (Computer Engineering) (Semester – I) Examination, 2011
MICROPROCESSORS AND MICROCONTROLLERS
(2003 Course)**

Time : 3 Hours

Max. Marks : 100

- Instructions :** 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 draw **wherever** necessary.
5) Figures to the **right** indicate **full** marks.
6) Assume **suitable** data, if necessary.

SECTION – I

1. a) With the help of neat block diagram, explain the architecture of Pentium Processor. 8
b) State and explain the conditions that Instructions in Pentium can be paired and be executed in parallel. 6
c) List the features of Real mode of Pentium Processor. 4
- OR
2. a) Which features makes Pentium, a superscalar processor ? Explain in detail. 6
b) Explain Data Cache organization of Pentium Processor. 6
c) What is the function of each of the following pins ? 6
i) \overline{ADS} ii) \overline{NA} iii) $\overline{BE7} - \overline{BE0}$
3. a) List and explain protected mode registers of Pentium Processor. 6
b) What is BIST ? Explain in detail. 6
c) Explain different data types supported by Pentium Processor. 4

OR

P.T.O.



- 4. a) Describe different addressing modes in Pentium along with suitable examples. 8
- b) Draw and explain timing diagram of non-pipelined read cycle. 8
- 5. a) What is TLB ? Describe its use in Pentium in detail. 8
- b) Explain the process of Logical to Linear address translation in Pentium. Draw the required data structures. 8

OR

- 6. a) Which bits of PDE and PTE provide page level protection in Pentium. 6
- b) Explain CALL GATE mechanism in Pentium Processor. 6
- c) Explain significance of Granularity bit, Limit field in Segment Descriptor. 4

SECTION – II

- 7. a) What is TSS ? What are the contents of it ? Discuss its use in multitasking. 8
- b) Discuss interrupt and exception handling in protected mode of Pentium. Which gate descriptors are found in IDT of Pentium ? 8
- c) Show the logical to physical address translation in virtual 8086 mode. 2

OR

- 8. a) What is I/O permission bit map ? When is it referred by Pentium ? 6
- b) What is the role of Task Register in Pentium ? What is the difference between TSS descriptor and task gate descriptor ? 8
- c) Discuss how Pentium enters and leaves virtual 8086 mode. 4
- 9. a) Describe Internal and external memory organization for program and data memory in 8051. 8
- b) What are different sources of interrupts in 8051 ? Describe interrupt handling mechanism in 8051. 8

OR



10. a) Describe power saving modes in 8051. **6**
- b) Describe serial port of 8051. Also explain the associated SFR to configure this port. **6**
- c) Describe features of 8051 microcontroller. **4**
11. a) Describe the program and data memory organisation in PIC16CXX microcontroller family. **8**
- b) Describe the features of PIC16F8XX microcontroller family. **8**

OR

12. a) Describe the interrupt structure in PIC16CXX series. **6**
- b) Explain working of watchdog timer in PIC16CXX. **6**
- c) How many timers are present in PIC16CXX microcontroller ? Describe working of timer 0 in details. **4**



T.E. (Computer) (Semester – I) Examination, 2011
DIGITAL SIGNAL PROCESSING
(2003 Course)

Time: 3 Hours

Max. Marks: 100

- Instructions :* 1) 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.
- 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

1. A) State the sampling theorem and explain the quantization process in ADC. **8**
- B) Define the impulse response of the DT system. Show that $-h(n) = 0$ for $n < 0$ for a causal system. **8**
- OR
2. A) State and explain the following properties of a DT system : **8**
- i) Time Invariant
- ii) Stability.
- B) Obtain linear convolution of two DT signals : **8**
- $x_1(n) = \{-2, 0, \frac{1}{2}, 3\}$ and
- $x_2(n) = \{-1, \frac{2}{3}, 1, -2\}$



3. A) Derive the relationship between Z-transform (ZT) and Fourier-Transform (FT). Define the term ROC. **8**

B) Obtain FT of a DT signal : $x(n) = \left(\frac{1}{2}\right)^n u(n)$. What is magnitude response ? **8**

OR

4. A) Using ZT properties, obtain ZT of : **8**

$$x(n) = (n - 1) u(-n - 1)$$

Specify the ROC.

B) Obtain IZT using power series method for $X(z) = \frac{z}{z - a}$, ROC $|z| < a$. **8**

5. A) Explain the simple geometric construction method to obtain the frequency response of a DT system. **10**

B) Obtain the unit step response for a system

$$y(n) = x(n) - 2y(n - 1) \quad \mathbf{8}$$

With all initial conditions = 0

OR

6. A) Define a system function $H(z)$. What is a pole zero plot ? Determine $H(z)$ and obtain the Impulse Response for a system –

$$y(n) + \frac{3}{4}y(n - 1) + \frac{1}{8}y(n - 2) = x(n) + x(n - 1) \quad \mathbf{10}$$

B) Obtain $H(z)$ from N^{th} order general difference equation. Express it as –

i) All zero system and ii) All pole system **8**



SECTION – II

7. A) Define N point DFT. How it can be obtained from FT ? State any 3 properties of DFT. **8**

B) Compare linear convolution with circular convolution. Obtain 4-point circular convolution for $x(n) = h(n) = \{1, 1, 1\}$. **10**

OR

8. Derive Radix – 2 DIF (Decimation in Frequency) FFT algorithm. Draw a signal flow graph for $N = 8$. Explain its various features and state the computational complexity. **18**

9. A) Explain the Gibbs phenomenon and define any 2 window functions w.r.t. FIR filter design. **8**

B) Compare between FIR and IIR filter. Discuss the advantages of DT filter over a CT filter. **8**

OR

10. A) Explain the BLT method for the design of IIR filter. **8**

B) Discuss mapping of S-plane onto Z-plane. Write the design steps of Impulse-Invariance method for IIR filter. **8**

11. A) Compare direct form – I and form – II IIR filter structures. Draw form – II for the length $M = 3$ (ie 2nd order filter). **8**

B) Explain the Direct Form and Cascade Form FIR filter structure. **8**

OR

12. A) Obtain system function $H(z)$ and draw a Direct - Form I filter structure for a system –

$$y(n) = x(n) - x(n - 1) + x(n - 2) + y(n - 1) - \frac{1}{2}y(n - 2) \quad \mathbf{8}$$

B) Explain different features of ADSP 21 XX processor. What is DAG ? **8**



T.E. (Computer) (Semester – I) Examination, 2011
THEORY OF COMPUTATIONS
(2003 Course)

Time : 3 Hours

Max. Marks : 100

- N.B. :**
- 1) Answer **three** questions from **each** Section.
 - 2) Answer to the **two** Sections should be written in **separate** answer-books.
 - 3) **Neat** diagrams must be drawn **whenever** necessary.
 - 4) Figures to the **right** indicate **full** marks.
 - 5) **Assume** suitable data, if **necessary**.

SECTION – I

1. a) Construct a NFA that accept any positive number of occurrences of various strings from the following language L given by

$$L = \{x \in \{a, b\}^+ \mid x \text{ ends with } aab\}.$$

6

- b) For each of the following regular expression, draw an Finite Automata recognizing the corresponding language.

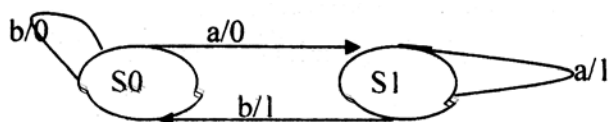
10

- 1) $(10 + 1 + 110)^*1$
- 2) $1(10 + 01)^* + 0(10 + 11)^*$
- 3) $(010 + 100)^*(10)$
- 4) $1(1 + 10)^* + 10(0 + 01)^*$

OR

2. a) Convert the following Mealy machine to Moore machine and what is the output of this mealy machine ?

6



- b) Construct a NFA and then equivalent DFA accepting strings over $\{0, 1\}$, whose every block of 4 consecutive symbol, contain at least 3 zeroes (i.e. 0's)

10

P.T.O.



3. a) Explain your answer in **each** of the following : 6
1. Every subset of a regular language is regular
 - 2) Every regular language has a regular proper subset.
- b) Find the regular expression corresponding to each of the following subset of $\{0, 1\}^*$
- a) The language of all strings not containing the substring 000
 - b) The language of all strings that do not contain then substring 110
 - c) The language of all strings containing both 101 and 010 as substring. 10

OR

4. a) Find out whether given languages are regular or not
- a) $L = \{ww \mid w \in \{0,1\}^*\}$
 - b) $L = \{1^k \mid k = n^2, n \geq 1\}$ 8

- b) With suitable example, prove the following theorem
 “The regular sets are closed under union, concatenation, and kleene closure”. 8

5. a) Draw NFA accepting the language generated by grammar with production and show the language define by following grammar

$$S \rightarrow abA / bB / aba$$

$$A \rightarrow b / aB / bA$$

$$B \rightarrow aB / aA.$$

10

- b) Construct the right linear grammar corresponding to the regular expression

$$R = (1 + (01)^*) 1^* (0 + 1).$$

8

OR

6. a) Describe the language generated by each of these grammar and justify your answer with the example string derive from the grammar of the productions given below.

$$1) S \rightarrow aSa / bSb / aAb / bAa$$

$$A \rightarrow aAa / bAb / a / b \varepsilon$$

$$2) S \rightarrow bT / aT / \varepsilon$$

$$T \rightarrow aS / bS.$$

12

- b) Convert the following grammar to Chomsky Normal form (CNF)

$$S \rightarrow Aba, A \rightarrow aab, B \rightarrow Ac.$$

6



SECTION – II

7. a) Give the transition table for PDAs recognizing each of the following languages
- a) the languages of all palindromes over {a, b}
 - b) $\{a^n x \mid n \geq 0, x \in \{a, b\}^* \text{ and } |x| \leq n\}$. 12
- b) Define regular language, context free language and context sensitive language with example. 6

OR

8. a) Find whether the string $x = aabbb$ is in $L = L(G)$, where G is given by $S \rightarrow XY, X \rightarrow YY \mid a, Y \rightarrow XY \mid b$. 6
- b) Find context free grammars generating each of these languages
- 1) $L_1 = \{a^i b^j c^k \mid i = j + k\}$
 - 2) $L_2 = \{a^i b^j c^k \mid j = i + k\}$
 - 3) $L_3 = \{a^i b^j c^k \mid i = j \text{ or } j = k\}$. 12

9. a) Explain the following variations of the Turing machine
- 1) Single infinite tape Turing machine
 - 2) Multitape or Multitrack Turing machine
 - 3) Multitape or Multitrack Turing machine. 8
- b) Draw a transitions table for Turing machine accepting each of the following languages. 8
- a) $\{a^i b^j \mid i < j\}$
 - b) the language of balanced strings of parentheses.

OR

10. a) Let T be the Turing machine defined by the 5-tuples
- $(S_0, 0, 0, S_1, L)$
 - $(S_0, 1, 0, S_0, L)$
 - $(S_0, B, B, \text{Halt}, L)$
 - $(S_1, 0, 1, S_0, L)$
 - $(S_1, 1, 1, S_0, R)$
- for each of the following initial tapes, determine the final tape when T halts, assuming that T begins in initial position
- a) 110B
 - b) 0011B
 - c) 0101B. 12
- b) Show that it is undecidable whether a TM halts on all inputs. 4



11. a) Let G be a CFG and r be a regular expression. Show that the problem
- 1) $L(G) = L(r)$
 - 2) $L(r) \in L(G)$ are undecidable. **10**
- b) Define the following cardinality of the set with example
- 1) countable
 - 2) countable infinite
 - 3) uncountable. **6**
- OR
12. a) Define the term :
- i) Complete problem
 - ii) NP complete problem
 - iii) Intractable problem
 - iv) Post correspondence problem. **8**
- b) Show that the following problem is undecidable ; “Given a TM, T is $L(T)$ regular or context free or recursive or none “. **8**
-



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T.E. Computer (Semester – II) Examination, 2011
PRINCIPLES OF PROGRAMMING LANGUAGES
(2003 Course)

Time : 3 Hours

Max. Marks : 100

- Instructions :** 1) Answer **any three** questions from **each** Section.
2) Answers to the two Sections should be written in **separate** books.
3) **Neat** diagram must be drawn **wherever** necessary.
4) Black figures to the **right** indicate **full** marks.
5) Assume **suitable** data, if necessary.

SECTION – 1

1. a) State and explain various challenges in Language design. **8**
b) With suitable example explain the significance of **8**
1) Structured and non structured data type.
2) Composite data types.

OR

2. a) Can programming language exist without keywords ? Can programmers
redefine identifiers ? Justify. **8**
b) What are the advantages and disadvantages of having case-sensitive identifiers
in a programming languages with respect to program reliability, type checking
and compile time complexity ? **8**
3. a) What are design principles for procedural programming specifications ? **6**
b) Explain in brief significance of following attributes of a variable **6**
i) Name ii) Address iii) Value iv) Type
c) With suitable diagram demonstrate the execution steps for procedural
programming. **4**

OR

P.T.O.



4. a) Explain following concepts with suitable examples. **8**
- 1) Exception and Exception handler.
 - 2) Raising an Exception.
 - 3) Build in Exception.
 - 4) Continuation.
- b) Write a single program fragment producing different results with respect to following parameter passing methods. **8**
- 1) Call by Value
 - 2) Call by Reference
 - 3) Call by Name.
5. a) What is an alias ? Which categories of C++ reference variables are always alias ? **6**
- b) Define and explain : **6**
- iii) Fixed stack- dynamic arrays
 - iv) Fixed heap - dynamic arrays.
- What are advantages of each ?
- c) Nested procedures and functions acts as an efficient program design constructs. Demonstrate with suitable example. **6**
- OR
6. a) What are major advantages of type checking and type conversions ? **6**
- b) What are variant records ? Explain how variant records are implemented in 'C' and 'Pascal'. **6**
- c) Explain Current Instruction Pointer (CIP) and Current Environmental Pointer (CEP). How do these are used for recursive programs ? **6**



SECTION – 2

7. a) If adequate memory is not available to allocate a new variable by using new operator, what measure can you take so that every time you don't have to check whether the memory allocation has failed or not ? **6**
- b) Suppose the base class and derived class each have a member function with the same signature. When you have a pointer to a base class object and call a function member through the pointer, explain how will determine which function is actually called ? (Base class member function or the derived class function). **6**
- c) Answer following questions about destructor. **6**
- 1) What is destructor ?
 - 2) When is called ?
 - 3) What does a destructor actually do ?

OR

8. a) Compare Java Applications and Java Applets. Draw typical applet life cycle. **6**
- b) Comment on "C# is strongly typed language". **4**
- c) Explain in brief following constructs with respect to .NET framework. **8**
- 1) Arrays
 - 2) Interfaces
 - 3) Assemblies
 - 4) Event handler.
9. a) What are characteristics and key features of Logical Programming Specification. **8**
- b) Explain in brief flowing classification of first order predicate calculus **8**
- 1) Logical Statement.
 - 2) Connector.
 - 3) Quantifier.
 - 4) Precedence.

OR



10. a) Explain the data types and operations supported by following Prolog Data types. **8**
- 1) Atoms
 - 2) Variables
 - 3) Numbers.
- b) What is difference between Instantiation, Matching and Unification. **8**
11. a) Write a LISP Functions. **6**
- 1) To identify last element of Non-Null list.
 - 2) To calculate factorial of a given number.
- b) What is output of following LISP functions : **6**
- 1) (EXPT 4 3)
 - 2) (RECIP 5)
 - 3) (> 6 6)
 - 4) (ONE P 1.0)
 - 5) (SETQ X' (1 2 3))
 - 6) (SETQ Y X)
- c) What do you mean by association list with respect to LISP ? **4**
- OR
12. a) Write equivalent LISP function for following Ackermann's function. **6**
- $$\text{Ack}(0, n) = n + 1$$
- $$\text{Ack}(m, 0) = \text{Ack}(m - 1, 1)$$
- $$\text{Ack}(m, n) = \text{Ack}(m - 1, \text{Ack}(m, n - 1)).$$
- b) Explain in brief functions for reading and writing from files in LISP. **6**
- c) Explain Innermost and Outermost expression evaluation techniques with suitable examples. **4**



T.E. Computer (Semester – II) Examination, 2011
COMPUTER NETWORKS
(2003 Course)

Time : 3 Hours

Max. Marks : 100

- Instructions :** 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 **whenever** necessary.
4) **Black** figures to the **right** indicates **full** marks.

SECTION – I

1. a) What are the network design issues involved in designing a typical network. **8**
b) What is frame relay ? Give some application of frame relay. **8**

OR

2. a) Explain the physical layer access mechanisms and the MAC layer frame format for wireless LAN 802.11 ? **8**
b) What is the principal difference between connectionless and connection oriented protocol ? Also compare TCP/IP and OSI reference model ? **8**
3. a) If the unit exchanged at the data link level is called a frame and the unit exchanged at the network level is called a packet, do frames encapsulate packets or do packets encapsulate frames ? Explain your answer. **8**
b) Which of the OSI layer handle each of the following ? Explain.
1) Dividing the transmitted bit stream into frames
2) Determine which route through the subnet to use. **8**

OR

4. a) Explain with the help of phase diagram, working of PPP. List all the activities carried out during each phase. **8**
b) Give a two example of computer application for which connection oriented service is appropriate. Give two examples for which connectionless service is best. **8**

P.T.O.



5. a) In stop and wait protocol define and discuss the handling of 9
i) Damaged frame
ii) Lost frame
b) What is the basic purpose of MAC layer protocol ? Explain function of Ethernet protocol. 9

OR

6. a) Explain CSMA/CD protocol with binary exponential back off algorithm used in internet. 9
b) What is bridge ? Explain the operation of a LAN bridge from 802.3 to 802.4. 9

SECTION – II

7. a) A COMPUTER ON 6 Mbps network is regulated by token bucket. The bucket is filled at the rate of 1 Mbps. It is initially filled to capacity with 8 megabits. How long can the computer transmit at the full 6 Mbps. 8
b) Explain design issue of Network layer. 8

OR

8. a) Explain the working of RIP. Also explain common problem occurs in RIP. 8
b) Explain the function of Network layer in ATM network. 8
9. a) What is count to infinity problem ? Explain it with suitable example. 8
b) Describe the format of TCP header. 8

OR

10. a) Explain the congestion prevention policy of the Data link layer, Network layer, Transport layer. 8
b) Explain three way handshakes in transport layer . 8



11. a) How FTP works ? Explain. 9
- b) What is WWW ? How it works ? What is the difference between static and dynamic web pages ? 9

OR

12. a) What are the three main components of internet mail system ? Explain briefly three SMTP command issued by client. 9
- b) Explain Email architecture and services. 9



T. E. (Computer) (Semester – II) Examination, 2011
MANAGEMENT INFORMATION SYSTEMS
(2003 Course)

Time : 3 Hours

Max: Marks : 100

- Instructions :**
- 1) Answers to the **two** Sections should be written in **separate** answer books.
 - 2) Figures to the **right** indicate **full** marks.
 - 3) From Section **I**, answer (Q. 1 or Q. 2) and (Q. 3 or Q. 4) and (Q. 5 or Q. 6).
 - 4) From Section **II**, answer (Q. 7 or Q. 8) and (Q. 9 or Q. 10) and (Q. 11 or Q. 12).
 - 5) **Neat** diagrams must be drawn **wherever** necessary.
 - 6) Make suitable assumptions **wherever** appropriate and relevant.

SECTION – I

1. a) What is the need of information systems ? Explain the various types of information systems. 9
- b) Define Management Information System (MIS). Explain the various levels of management. 8
- OR
2. a) What is infrastructure management ? Explain the essentiality of strategic planning. 9
- b) Enlist and elaborate on the various functions of the manager in detail. 8
3. a) What is change management ? Explain the implementation challenges in change management. 9
- b) Explain the applications of Management Information Systems (MIS) in the service industry. 8

OR



4. a) Explain the applications of Management Information Systems (MIS) in :
i) Banking sector
ii) Insurance sector. **9**
- b) Explain the importance of Production Management in manufacturing sector. **8**
5. a) Explain the implementation steps of Enterprise Resource Planning (ERP) Systems. Enlist the benefits of Enterprise Resource Planning (ERP) Systems. **8**
- b) What is Business process Outsourcing (BPO) ? Discuss types of Business Process Outsourcing (BPO). What are the challenges in Business Process Outsourcing (BPO) management ? **8**
- OR
6. a) What is Business process Re-engineering ? Explain.
What is process and value stream model of organization ? Explain. **8**
- b) What are the basic features of Enterprise Resource Planning (ERP) systems ? Describe standard Enterprise Resource Planning (ERP) modules. **8**

SECTION – II

7. a) What is Customer Relationship Management ? Explain the challenges and trends in Customer Relationship Management (CRM). **9**
- b) Write short notes on : **8**
i) Supply chain Management
ii) Electronic payment processes.
- OR
8. a) Explain B2B, B2C and C2C types of e-Commerce. **9**
- b) Write short notes on : **8**
i) Three phases of Customer Relationship Management
ii) e-Commerce applications.



9. a) List the different domains of Artificial Intelligence. Explain the various applications of Artificial Intelligence. **9**
- b) Explain the following : **8**
- i) Data mining for decision support system
 - ii) Executive Information Systems.
- OR
10. a) What is Decision Support System (DSS) ? Explain what -if analysis and Goal-seeking analysis using Decision Support System (DSS). **9**
- b) Write short notes on : **8**
- i) Data Warehouse
 - ii) Geographical Information Systems (GIS)
11. a) Explain Disaster recovery. What is disaster recovery plan ?
Explain the steps involved in developing a disaster recovery plan. **8**
- b) Explain the following aspects of security management : **8**
- i) Encryption
 - ii) Firewalls
 - iii) Email monitoring.
- OR
12. a) Explain fault tolerant systems. What do you understand by contingency management ? **8**
- b) Explain the following : **8**
- i) Biometric security
 - ii) Global IT management.



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T.E. (Semester – II) (Computer) Examination, 2011
SYSTEMS PROGRAMMING
(2003 Course)

Time : 3 Hours

Max. Marks : 100

- Instructions:* 1) Answer **any 3** questions from **each** Section.
2) Answers to the **two** Sections should be written in **separate** books.
3) Black figures to the **right** indicates **full** marks.

SECTION – I

1. a) Explain various components of system software. **6**
- b) Match the following : **4**
- | | |
|------------------------------------|-----------------|
| i) Macro definition table | a) Switch |
| ii) Macro name table | b) Macro call |
| iii) Argument list array | c) MDT index |
| iv) Macro definition level counter | d) Index marker |
- c) Compare two variants of intermediate code generated by an assembler. **4**
- d) How literals are handled by Assembler ? Explain use of LTROG instruction. **4**

OR

2. a) Define language processor. Also explain various language processing tools. **6**
- b) What is Analysis and Synthesis phase of assembler. Explain with example. **6**
- c) Comment on the statement “Programs with macros require more space and less time at runtime than programs with functions”. **4**
- d) Define : **2**
- | |
|--------------------|
| i) Assembler |
| ii) Pseudo-opcode. |

P.T.O.



- 3. a) Explain Relocating Loader. 8
- b) What is overlay structure ? What is its use ? 4
- c) What is a callback function ? Explain need for the same. 4

OR

- 4. a) Compare Absolute loader and compile and Go loader. 8
- b) Explain design of MS-DOS linker. 8
- 5. a) Define the following terms - 4
 - i) Bootstrap compiler
 - ii) Cross compiler.

- b) Compare following : 8
 - i) top-down parser and bottom-up parser
 - ii) Compiler and interpreter.

- c) Explain with example the need of Lexical analyzer ? 4

OR

- 6. a) Write output of Lexical Analyzer for the following ‘C’ program. Show contents of all the tables. 8

```
main ()  
{  
    int num1, num2, num3;  
    num1 = 10;  
    num2 = 20;  
    num3 = num1 + num2;  
    printf ("%d", num3);  
}
```

- b) Explain the front-end and back-end model of compiler. 8



SECTION – II

- 7. a) What is a system call ? Explain in detail. List different types of system calls. **6**
- b) Draw diagram of process control block. Explain all the fields. **6**
- c) Write the pseudo code for shortest job first job scheduling. **6**

OR

- 8. a) Explain Multitasking systems and Real time operating systems. **6**
- b) Consider the following set of processes. Assume the processes are arrived in the order P1, P2, P3, P4, P5 all at time 0. **8**

Process	Burst Time
P1	10
P2	1
P3	2
P4	1
P5	5

Draw the Gantt Chart for Round Robin scheduling algorithm (time quantum is 1). Calculate the waiting time and turnaround time of each process. Also calculate average turnaround and average waiting time.

- c) Draw and explain process state diagram. **4**
- 9. a) What is external fragmentation ? Explain how this problem can be solved. **8**
- b) Differentiate between Paging and Segmentation. **4**
- c) What is Thrashing ? What is the cause of it ? **4**

OR



10. a) Explain and compare first-fit, best-fit and worst-fit memory allocation strategies. **4**
- b) How many page faults will occur for the following reference string for Last Recently Used and Optimal page replacement scheme. **8**
- 1, 2, 3, 4, 5, 3, 4, 1, 6, 7, 8, 7, 8, 9, 7, 8, 9, 5, 4, 5, 4, 2
- What is the minimum number of page faults that can occur in both the cases ?
- c) Compare logical and physical address. **4**
11. a) The disk drive has 100 cylinders numbered 0 to 99. The current position of the head is 50. The queue of the pending requests in FIFO is
- 44, 20, 95, 4, 50, 52, 47, 61, 87, 25
- Starting from the current head position what is the total distance that the disk arm moves to satisfy all the pending requests for FCFS and SSTF disk scheduling algorithm. **8**
- b) With example explain various free space management techniques. **8**
- OR
12. a) Compare linked and indexed allocation with example. **8**
- b) Explain Elevator algorithm with an example. **8**



[4063] – 14

**T.E. (Semester – I) (Mechanical) Examination, 2011
INDUSTRIAL ENGINEERING AND MANAGEMENT
(2003 Course)**

Time : 3 Hours

Max. Marks : 100

- Instructions :** 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) Black 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

1. a) Define “Industrial Engineering” and state its importance in Industry. **6**
- b) Draw with suitable illustration “Operation process chart” and “Material type flow process chart”. **6**
- c) State and explain any four techniques of work measurement. **4**

OR

2. a) State and explain any six tools and techniques used in Industrial Engineering. **6**
- b) Define “Method study” and state its importance as a part of work study. Also list various steps in “Method study”. **4**

P.T.O.



- c) The observed time and performance rating for the five elements in a work study are given below. Compute standard time per piece assuming Rest and personal allowance as 10% and contingency allowance as 2% of Basic time

Element	1	2	3	4	5
Observer time (min)	0.3	0.08	0.5	2.5	0.2
Rating	80	85	90	85	80

6

3. a) Define Anthropometry. Explain its use in Design of a system. 6
- b) Explain any four ergonomic considerations in the design of a product. 6
- c) Explain any 4 types of displays used in a man-machine system. 4

OR

4. a) Define “Ergonomics”. Explain its importance in Industrial Engineering. 6
- b) Describe any four factors to be considered for design of a workspace. 6
- c) Sketch the maximum and normal hand capacities for a seated person in a given area. 4
5. a) Define “Management”. Explain the principles of scientific management. 6
- b) State and explain the three forms of organization structure. 6
- c) Define “Production” and “Productivity”. State and explain five techniques to improve productivity. 6

OR

6. a) Explain the functions of “Management”. 6
- b) Define “Motivation”. Explain the “Maslow’s theory of needs”. 6
- c) Define “Leadership”. Explain five important qualities of a good leader. 6



SECTION – II

7. a) What do you understand by terms financial planning ? State and explain various steps involved in financial planning. **8**
- b) Explain with example what is working capital. Why working capital is required ? What are determinants of it ? **8**

OR

8. a) Explain the following terms in brief. **8**
- 1) Budget
 - 2) Budgeting
 - 3) Budgetary control
- b) Define standard cost and standard costing. State various steps to be observed in standard costing. **8**
9. a) List out various conditions for city, suburbans and country while selection of site for a plant. Explain how best site is decided, on basis of evaluation. **8**
- b) Explain interrelation ship between material handling and plant layout. **8**

OR

10. a) State and explain various factors affecting design of plant layout. **8**
- b) What are the various equipments used for material Handling ? Sketch and explain in brief. **8**
11. a) The past data regarding the sales of SPMS for the last five years is given. Using the least square method, fit a straight line, Estimate the sales for the year 2006 and 2007. **8**

Year	2001	2002	2003	2004	2005
Sales ('00)	35	56	79	80	40



- b) Explain different types of inventories keep in industry. **5**
- c) Define the following **5**
 - 1) Reorder point (level)
 - 2) Safety stock

OR

12. Write short note on the following (**any three**). **18**

- 1) BOM
- 2) Sales forecasting Techniques
- 3) Benifit and Limitations of MRP
- 4) FMS
- 5) VED.



[4063] – 141

**T.E. (IT) (Semester – I) Examination, 2011
OPERATING SYSTEMS
(2003 Course)**

Time : 3 Hours

Max. Marks : 100

- Instructions :**
- 1) Answer **all** questions for **each** section.
 - 2) Answer 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, **wherever** necessary.

SECTION – I

1. a) Describe in detail the functions of an operating system as a Resource Manager. **8**
b) Explain any two architectures of operating Systems with examples. **8**
OR
2. a) Describe with the help of a neat diagram the interaction of the Operating Systems with the hardware architecture. **8**
b) Explain the following terms : **8**
 - 1) System calls
 - 2) Multiprogramming
 - 3) Multiprocessing
 - 4) Context switch.
3. a) Explain process control block in detail. **8**
b) Explain the difference between program and process. **2**
c) Explain UNIX process state diagram in detail. **8**
OR
4. a) Explain the requirements for Mutual Exclusion. **4**
b) Explain the bounded-buffer producer-consumer problem. **6**
c) Explain the Deadlock detection algorithm with example. **8**

P.T.O.



- 5. a) State and explain the scheduling criteria for the uniprocessor scheduling. **4**
- b) Explain the types of scheduling. **4**
- c) Explain Round Robin scheduling algorithm with example. **8**

OR

- 6. a) List and explain four classes of real-time scheduling. **8**
- b) State four approaches for multiprocessor thread scheduling and processor assignment. **8**

SECTION – II

- 7. a) A process references pages in the following order 2, 3, 4, 6, 4, 5, 2, 4, 5, 6, 3, 8, 6, 4, 7, 5. Use optimal and LRU page replacement algorithms to find out the number of page faults for the above reference string using 3 page frames. **10**
- b) Explain the concept of demand paging with the help of neat diagrams. **8**

OR

- 8. a) Explain the following memory allocation strategies with the help of neat diagrams.
1) Best fit 2) First fit 3) Next fit 4) Worst fit **10**
- b) Explain dynamic partitioning technique in detail. **8**

- 9. a) Describe any four types of file organizations. **8**
- b) Describe three levels of record blocking with the help of neat diagram. **8**

OR

- 10. a) Explain the evolution of I/O function in detail. **6**
- b) Explain any three disk scheduling algorithms. **10**
- 11. a) State and explain different methods for user authentication for security. **8**
- b) Write a shell script for the following : **8**
 - 1) To find whether a given number is prime or not
 - 2) To find the factorial of a given number.

OR

- 12. a) How is security implemented in Windows 2000 ? **8**
- b) How is security implemented in UNIX ? **8**



[4063] – 143

T.E. (Information Technology) (Semester – I) Examination, 2011
DATA COMMUNICATION AND NETWORKING
(2003 Course)

Time : 3 Hours

Max. Marks : 100

- Instructions :** 1) Answer 3 questions from Section I and 3 questions from Section – II.
2) **Neat** diagrams must be drawn **wherever** necessary.
3) Assume suitable data, **if necessary**.

SECTION – I

1. A) Explain CRC generation method with suitable example. **8**
B) Explain the shift keying techniques with suitable diagram and constellation pattern for the following : **10**
1) PSK 2) FSK 3) ASK 4) QAM
OR
2. A) Discuss the hamming code technique. Calculate hamming code if data to be sent is 1001101. **9**
B) State and explain Shannon's capacity theorem. **9**
3. A) Explain FDM and statistical TDM. **8**
B) Explain cable modem technology with suitable diagram. **8**
OR
4. A) Explain E1/T1, E3/T3 Carrier System. **8**
B) Compare Circuit Switching, Message Switching and Packet Switching. **8**
5. A) Explain with suitable examples guided transmission media and unguided transmission media. **8**
B) Explain the main components of satellite communication. **8**
OR

P.T.O.



- 6. A) Compare : i) Single mode and multimode fiber. 8
 - ii) Step index and graded index fiber. 8
- B) Explain various losses of the fiber optic communication. 8

SECTION – II

- 7. A) Explain the TCP/IP Protocol stack. 8
 - B) Compare : 1) Repeater and Bridge 8
 - 2) Hub and Switch. 8
- OR

- 8. A) Describe OSI model in detail. 8
 - B) Explain the merits and demerits of star, bus, ring and mesh topologies. 8
 - 9. A) Explain ALOHA and Slotted ALOHA and comment on efficiency of each. 6
 - B) Explain PPP in brief. 6
 - C) What is gateway ? Explain its function. 6
- OR

- 10. A) Explain Stop and Wait ARQ and selective repeat ARQ in detail. 6
 - B) Explain the working of switch and router. 6
 - C) Write a short note on HDLC. 6
 - 11. A) Write a short note on Gigabit Ethernet. Compare Gigabit Ethernet with traditional Ethernet. 8
 - B) Discuss SONET with reference with following : 8
 - 1) Device Types
 - 2) Payloads and Frames.
- OR

- 12. A) Discuss the working of VLAN and state its advantages. 8
- B) Differentiate : 10Base5, 10Base2, 10BaseT Specifications. 8



T.E. (Semester – I) (Information Technology) Examination, 2011
THEORY OF COMPUTATION
(2003 Course)

Time : 3 Hours

Max. Marks : 100

- Instructions :**
- 1) Answer **any three** questions from **each** Sections.
 - 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

1. a) Define the following terms with example 10
- 1) Symbol 2) Alphabet
 - 3) DFA 4) NFA
 - 5) Word.
- b) Design a Moore and Mealy machine to generate 1's complement of a given binary number. 8

OR

2. a) Design Finite Automata which accepts even number of 0's and odd number of 1's. 10
- b) Consider the following NFA with ϵ -transitions. Convert this NFA to NFA without ϵ -moves : 8

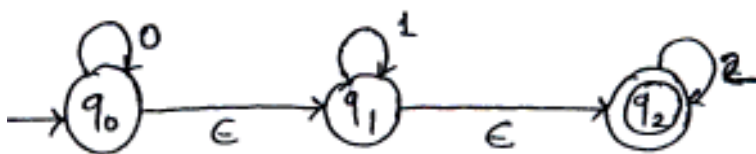


Fig. Q. 2 (b) (i)



3. a) Prove that $L = \{WW \mid W \text{ is in } (0 + 1)^*\}$ is non-regular. 6
- b) Convert the following automata given in fig. (i) and fig. (ii) to equivalent regular expression. 10

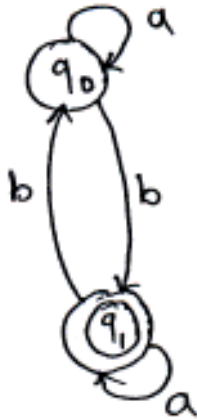


Fig. Q. 3 (b) (i)

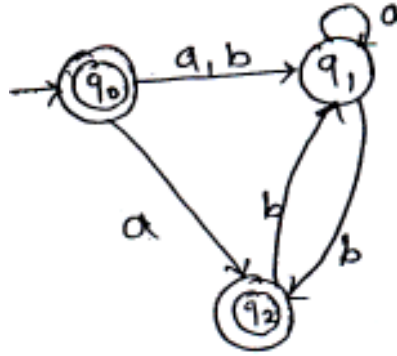


Fig. Q. 3 (b) (ii)

OR

4. a) Prove or disprove the following for regular expression r, s and t .
- 1) $(rs + r)^* r = r (sr + r)^*$
 - 2) $(r + s)^* = r^* + s^*$ 8
- b) Construct the finite automata equivalent to the following regular set and describe in English set denoted by following regular set 8
- 1) $10 + (0 + 11) 0^* 1$
 - 2) $01 [((10)^* + 111)^* + 0]^* 1$

5. a) Convert the following grammar to Greibach normal form, the grammar $G = (\{A_1, A_2, A_3\}, \{a, b\}, P, a)$ where P consists of following production :

$$A_1 \rightarrow A_2 A_3$$

$$A_2 \rightarrow A_3 A_1 \mid b$$

$$A_3 \rightarrow A_1 A_2 \mid a$$

8

- b) Let G be the grammar,

$$S \rightarrow aB \mid bA$$

$$A \rightarrow a \mid aS \mid bAA$$

$$B \rightarrow b \mid bS \mid aBB$$



For the string aaabbabba. Find

- 1) Leftmost derivation
- 2) Rightmost derivation
- 3) Parse tree
- 4) Is the grammar unambiguous.

8

OR

6. a) Convert the following grammar to Chomsky normal form to the following CFG :

$$S \rightarrow bA|aB$$

$$A \rightarrow bAA|aS|a$$

$$B \rightarrow aBB|bSbb$$

8

- b) Find context free grammar generating given language.

4

- 1) The set of odd length strings in $\{a, b\}^*$ with middle symbol a.
- 2) The set of even length strings in $\{a, b\}^*$ with two middle symbols equal.

- c) Check whether given grammar is ambiguous or unambiguous.

$$G = (\{S, A\}, \{a, b\}, P, S).$$

where P consists of

$$S \rightarrow aAS|a$$

$$A \rightarrow SbA|SS|ba.$$

4

SECTION – II

7. a) Design PDA to accept the language :

$$L = \{ a^n b^m c^n \mid m, n \geq 1 \}$$

8

- b) Design PDA equivalent to CFG

$$S \rightarrow oBB$$

$$B \rightarrow oS|iS|o$$

Enumerate all the rules of δ (delta) function. Test whether 010^4 is accepted by this PDA.

10

OR



8. a) Construct the PDA with following moves. Construct CFG equivalent to PDA.
 $M = (\{q_0, q_1\}, \{0, 1\}, \{B, R\}, \delta, q_0, R, \phi)$
 where δ is defined as :
- | | |
|---|----------|
| $\delta (q_0, 0, R) = (q_0, BR)$ | |
| $\delta (q_0, 0, B) = (q_0, BB)$ | |
| $\delta (q_0, 1, B) = (q_1, B)$ | |
| $\delta (q_1, 1, B) = (q_1, B)$ | |
| $\delta (q_1, 0, B) = (q_1, \epsilon)$ | |
| $\delta (q_1, \epsilon, R) = (q_1, \epsilon)$ | 8 |
- b) Define Pushdown automata. What are the different types of PDA ? What are applications of PDA ? **6**
- c) Explain how DPDA is different from NPDA. **4**
9. a) Design Turing machine to find 2's complement of a given binary number. **8**
- b) Write a short note on : **8**
 "Universal Turing Machine".
 OR
10. a) Design Turing Machine to multiply two unary numbers. **12**
- b) Write a short note on : **4**
 "Multitape Turing Machine".
11. a) Write notes on and compare it. **16**
- 1) Limitations of FA
 - 2) Limitations of PDA
 - 3) Limitations of TM.
- OR
12. a) Write a note on applications of CFG. **8**
- b) Explain Chomsky hierarchy and describe the machine that you have learnt that accept each type of grammar of Chomsky hierarchy. **8**



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T.E. (Information Technology) (Semester – II) Examination, 2011
SYSTEM SOFTWARE
(2003 Course)

Time : 3 Hours

Total Marks : 100

- Instructions :* 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) **Black** figures to the **right** indicate **full** marks.
- 5) **Use** of electronic pocket calculator **allowed**.
- 6) **Assume** suitable data, if **necessary**.

SECTION – I

1. a) Define the term language processor and explain various language processing activities. **8**
- b) List various types of editors. Explain line editor and give its merits and demerits. **8**
- c) Distinguish between system program and application program. **2**
- OR
2. a) Explain significance of debug monitor. **4**
- b) With the help of a neat block diagram explain structure of screen editor. **8**
- c) Compare compiler and interpreter. **6**
3. a) What feature of assembly language makes it mandatory to design a two pass assembler ? Explain with example. **6**
- b) Enlist various types of errors that are handled by Pass I and Pass II of two pass assembler. **6**
- c) Explain with example, various parameter passing mechanisms in macro processor. **4**

OR

P.T.O.



4. a) Explain following terms with macro :
- i) Expansion time variables
 - ii) Conditional assembly
 - iii) Nested macros. **10**
- b) Can macro processing be incorporated in an assembler ? Justify your answer. **6**
5. a) Explain the role of lexical analyser in compiler design. List the types of errors reported during lexical analysis phase of compiler. **6**
- b) Consider following grammar :
- $A \rightarrow aB$
- $B \rightarrow Ab$
- $B \rightarrow b$
- Show stepwise procedure for recognizing the input string “aabb” using bottom up parsing technique. **6**
- c) Explain the term left factoring with suitable example. **4**
- OR**
6. a) Explain various database/tables used by lexical analysis phase of compiler. **8**
- b) Explain the problems or difficulties faced by top down parser. Justify your answer with appropriate example. **8**



SECTION – II

7. a) For the statement given below, generate intermediate code in format :

- i) Quadruple
- ii) Triple
- iii) Postfix notation
- iv) Parse tree.

$$A = (-C + D)/(-P * (-Q + R)) \quad 8$$

b) Explain the importance of intermediate code generation in compiler. **4**

c) Explain in brief any two machine independent optimization techniques. **6**

OR

8. a) Explain the term activation record and explain its use in storage allocation. **8**

b) Explain with neat block diagram, all phases of compiler. Mention various data structures used by these phases. **10**

9. a) Draw a flow chart for Pass II of direct linking loader. **8**

b) Explain 'Compile and Go' loader scheme. What are the advantages and disadvantages of this scheme ? **8**

OR

10. a) List basic functions of loader and explain how they are performed in absolute loader scheme. **8**

b) What information must be supplied by an assembler to direct linking loader ? Explain the significance of this information with respect to the design of direct linking loader. **8**



11. a) List the different ways of inter-process communication in windows. **2**
- b) Explain the term dynamic link library. **6**
- c) Explain the term Dynamic Data Exchange. **8**

OR

12. a) Explain the use of call back function. **4**
- b) What is clip board ? How it is useful in system programming ? **6**
- c) Explain the term “object linking and embedding”. **6**



T.E. (Information Technology) (Semester – II) Examination, 2011
MANAGEMENT INFORMATION SYSTEMS
(2003 Course)

Time : 3 Hours

Max. Marks : 100

- Instructions :** 1) Answers to the **two** Sections should be written in **separate** sheet.
2) Use of logarithmic tables, slide rules and electronic pocket calculator is **allowed**.
3) Neat diagram must be drawn **wherever** necessary.
4) Black figures to the **right** indicate **full** marks.
5) Assume suitable data, if **necessary**.

SECTION – I

1. a) What is Management Information System ? State the factors to be considered for designing an effective Management Information System. **8**
b) 'Management Information Systems' creates an impact on the organizational function, performance and productivity. Justify with suitable example. **8**

OR

2. a) What is the need of Information System in any organization ? Explain components of Information System with suitable diagram. **8**
b) Explain the planning function of the manager. Also write the steps in planning. **8**
3. a) Explain material management. What information systems are required for material management ? **8**
b) What is HR management ? Explain transaction documents, applications and reports required for HR management. **8**

OR

4. a) Explain role and application of Management Information System in Banking sector. **8**
b) What is production system ? Explain the information systems supporting to detail working of the operation, allocation and planning of production management. **8**

P.T.O.



5. a) Explain tangible and intangible benefits of ERP briefly. **8**
 b) Explain Business process outsourcing. Why many companies are moving towards BPO business ? Also write the challenges in BPO. **10**

OR

6. a) What is Information Technology Architecture ? Explain with suitable example. **8**
 b) With suitable diagram explain Enterprise Management System. **10**

SECTION – II

7. a) What is electronic commerce ? Explain various models used in e-commerce . Also explain various resources required for setting e-commerce firm. **10**
 b) How Web Management Service helps companies to manage their e-business infrastructure much more effectively ? Explain. **8**

OR

8. a) List secure electronic payment processes in e-commerce. Explain any two in details. **10**
 b) What is customer Relationship Management ? Explain various phases involved in CRM. **8**

9. a) Explain major activities of Geographic Information System. Also explain how GIS is used for DSS. **8**
 b) Discuss the importance of an Executive Information System. How different is EIS from MIS ? **8**

OR

10. a) What is Decision ? Explain how Management Information System supports in decision making. **8**
 b) Describe benefits of knowledge management systems. Also write how it is used in decision making process ? **8**

11. a) What are various types of computer frauds ? What measures can be taken by the organization to prevent computer fraud ? **8**
 b) State and explain the ethical issue or responsibility of business professionals. **8**

OR

12. a) There are a number of social, moral and ethical issues associated with the introduction, and use, of IT systems. Explain. **8**
 b) A growing organization has been advised to write a corporate information systems security policy. What is the role of such a policy ? State four topics that should be covered in a security policy. **8**



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**T.E. (IT) (Semester – II) Examination, 2011
SOFTWARE ENGINEERING (2003 Course)**

Time : 3 Hours

Max. Marks : 100

- Instructions :*
- 1) Answer 3 questions from Section – I and 3 questions from Section – II.
 - 2) Answer to the **two** Sections should be written in **separate** books.
 - 3) **Neat** diagrams must be drawn **wherever** necessary.
 - 4) Black figures to the **right** indicate **full** marks.
 - 5) Assume suitable data, **if necessary**.

SECTION – I

1. a) Explain different types of software myths. 8
b) Explain the prototyping model as a software process model with an example. 8
- OR
2. a) Which software process model should be used for the following systems ?
Justify your answer. 8
 - i) Large scale and high risk software systems.
 - ii) A satellite launching system with extremely high reliability.
 - iii) An online course management system for any college/University.
- b) Compare personal process model and team process model. 8
3. a) List the core principles that focus on software engineering practises as a whole.
Explain communication principles in detail. 8
b) What is meant by system modelling and simulation ? With a neat diagram explain Hatley-Pirbhai modelling. 8

OR

P.T.O.



4. a) Explain in detail modelling principles as one of the core principles that focus on SE practises. **8**
- b) Explain data architecture, applications architecture and technical infrastructure as part of business process engineering. **8**
5. a) List and explain in brief various requirements engineering tasks. **8**
- b) Draw a use-case diagram and write the use-case scenario (Documentation) for any one use-case for ATM system. **10**

OR

6. a) Identify a few analysis classes for an ATM system and draw a class-diagram for the same. **8**
- b) Define the following terms w.r.t data modelling with examples data object, attributes, relationship, cardinality and modality. **10**

SECTION – II

7. 1) Explain how the analysis model helps in building the design model. **8**
- 2) Discuss the design issues in any user interface design. **8**

OR

8. 1) Explain the transform mapping technique used in architectural design which allows a DFD with transform flow characteristics to be mapped into a specific architectural style. **8**
- 2) List and explain various design concepts. **8**
9. 1) Explain the 4 Ps of management spectrum. **8**
- 2) Compare size and function oriented metrics. **6**
- 3) Explain the cocomo II model as an estimation model. **4**

OR



10. 1) Explain the W⁵HH principle. 8
- 2) Write a note on defect removal efficiency (DRE). 6
- 3) Explain software equation as an estimation model. 4
11. 1) Write a note on SCM repository. 8
- 2) Explain in detail the change control process of any software system. 8
- OR
12. 1) Write short notes on : 8
- a) Configuration audit
- b) Version control.
- 2) Draw and explain business process reengineering model. 8



[4063] – 15

T.E. (Mechanical) (Semester – I) Examination, 2011
COMPUTER ORIENTED NUMERICAL METHODS
(Common with Mech. S/W for Semester – II)
(2003 Course)

Time : 3 Hours

Max. Marks : 100

- Instructions :** 1) Answers to the *two* Sections should be written in *separate* books.
2) Black figures to the **right** indicate **full** marks.
3) Assume suitable data, if **necessary**.

SECTION – I

Unit – I

1. a) What do you mean by relative error ? How it is important in error analysis ? **6**

b) Using simplex method

Maximize $Z = 2x_1 + x_2 - 3x_3 + x_4$

Subjected to $x_1 + 7x_2 + 3x_3 + 7x_4 \leq 46$

$$3x_1 - x_2 + x_3 + 2x_4 \leq 8$$

$$2x_1 + 3x_2 - x_3 + x_4 \leq 10$$

$$x_1 ; x_2 ; x_3 ; x_4 \geq 0$$

10

OR

2. a) Maximize $Z = 5x_1 + 3x_2 + x_3$

Subject to

$$x_1 + x_2 + x_3 \leq 6$$

$$5x_1 + 3x_2 + 6x_3 \leq 15$$

$$x_1 ; x_2 ; x_3 \geq 0$$

10

b) Find the absolute and relative error while evaluating the following expression

$$\sqrt{x^2 + y^2} .$$

6

P.T.O.



Unit – II

3. a) From the following table of half yearly premium for policies maturing at different ages. Use suitable interpolation method to estimate the premium for policies maturing at the age of 46 and 63. 8

Age x	45	50	55	60	65
Premium y	114.84	96.16	83.32	74.48	68.48

- b) Write a computer program in C language for curve fit using power function of $Y = Ae^{BX}$. 8

OR

4. a) Draw a flowchart for evaluation and print of Newton's forward difference table. 6

- b) Following table gives test values got while testing a centrifugal pump. Assuming the relation is of type $H = A + BQ + CQ^2$, where Q is the discharge in liter per second and H is head in meter of water, find the values of A, B and C. 10

Q	2	2.5	3.0	3.5	4.0	4.5	5.0	5.5	6.0
H	18	17.8	17.5	17	15.8	14.8	13.3	11.7	9

Unit – III

5. a) Solve using LU decomposition method. 8

$$2X + 3Y + Z = 9$$

$$X + 2Y + 3Z = 6$$

$$3X + Y + 2Z = 8$$

- b) Draw the flow chart for finding derivatives using forward difference formula. 4

- c) From the following data find the first and second derivative at a point $x = 2$. 6

X	2	4	6	8	10
Y	105	42.7	25.3	16.7	13

OR



6. a) A rod is rotating in a plane. The following table gives the angle θ (in Radian) through which the rod has turned for different intervals of time t (in second). Calculate the angular velocity and acceleration of rod at $t = 1.0$ second. **6**

t	0	0.2	0.4	0.6	0.8	1.0
θ	0	0.12	0.49	1.12	2.02	3.20

- b) Draw a flow chart for Gauss Jordan method with partial pivoting to solve simultaneous equations. **8**
- c) Explain the advantages of partial pivoting for solving simultaneous equations using Gauss Elimination method. **4**

SECTION – II

Unit – IV

7. a) Find a square root of 20 correct to four decimal places by Successive Approximation Method. **7**
- b) State any three limitations of Newton Raphson method. **3**
- c) Write a computer program for Simpson's $\frac{3}{8}$ th rule for single integration. **6**

OR

8. a) Solve by Trapezoidal Rule

$$\int_0^1 \int_0^3 e^{-(x+y)} dx dy$$

$$\Delta x = 1, \Delta y = 0.25.$$

10

- b) Write a computer program for Newton Raphson method for 4 decimal place accuracy. **6**

Unit – V

9. a) Given $\frac{dy}{dx} = x^2 - y^2$, if at $x = 0, y = 1$, evaluate
- i) $y(0.1)$ by using modified ruler method correct to four decimal places,
- ii) $y(0.2)$ by using Taylor series method. Use the series upto third derivative (i.e. y'''). **10**
- b) Draw a flowchart for simultaneous ordinary differential equations solved by Runge Kutta of order 4 method. **6**

OR



10. a) Given $\frac{dy}{dx} = x^2(1+y)$,
 $y(1) = 1, y(1.1) = 1.233, y(1.2) = 1.548, y(1.3) = 1.979$. Evaluate $y(1.4)$ and $y(1.5)$ by using Milne Simpson's method correct to four decimal places. **10**
- b) Draw a flowchart and write a computer program for Euler method. **6**

Unit – VI

11. a) Solve Laplace equation $\nabla^2 u = 0$ for given boundary conditions shown in fig. 11a. **10**

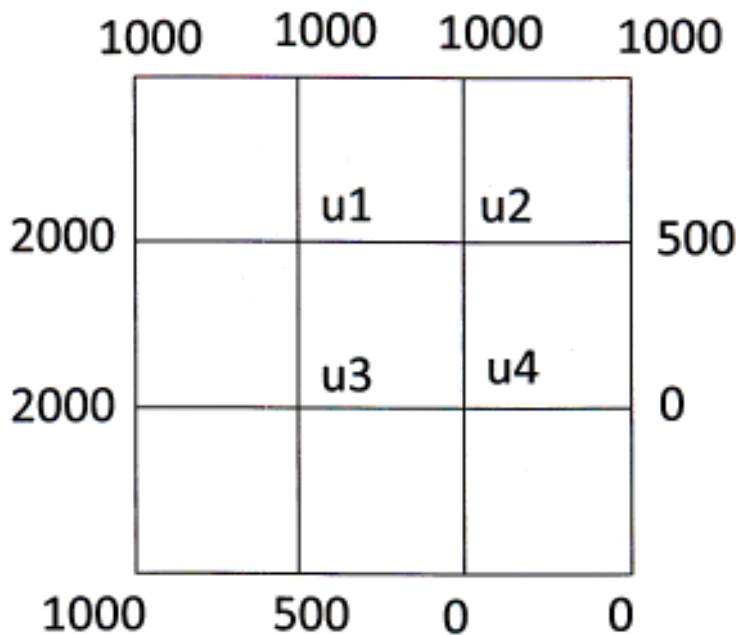


fig. 11a

- b) Draw a flowchart for wave equation. **8**
- OR
12. a) Applying Crank-Nicolson method with $\Delta x = 1, \Delta t = 0.5$, find the temperature $u(x, t)$ in the rod by considering the heat equation. $U_{xx} = u_t$ with initial condition $u(x, 0) = x(4 - x)$ and boundary conditions $u(0, t) = 0, u(4, t) = 0$ solve for $0 \leq t \leq 1$ **10**
- b) Draw a flowchart for Poisson's equation. **8**



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T.E. (Biotechnology) (Semester – I) Examination, 2011
BIOCHEMISTRY – II
(2003 Course)

Time: 3 Hours

Max. Marks: 100

- N.B. : i) 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.*
- ii) Answer to the two Sections should be written in separate books.*
- iii) Neat diagrams must be drawn wherever necessary.*
- iv) Use of logarithmic tables slide rule, electronics pocket calculator is allowed.*

SECTION – I

1. Explain in detail (6 Marks each) : 18
- 1) Reversible inhibition of enzyme.
 - 2) Enzymatic activity of molecule other than protein.
 - 3) Multienzyme complex.
- OR
2. Explain the catalytic mechanism of any enzyme with reference to specific examples. 18
3. Describe in detail the reaction mechanism of pyruvate dehydrogenase and the role of TPP as catalytic cofactor. 16
- OR
4. Decipher the role of coenzyme A as acyl group carrier. 16
5. Enlist the four main types of receptors. Explain in detail the role of each receptor with one example. 16

OR

P.T.O.



6. Describe the following terms with suitable example 16
- 1) G-protein coupled receptors.
 - 2) Nuclear receptors.

SECTION – II

7. Answer the following (9 Marks each) : 18
- 1) Tertiary structure of protein with one example.
 - 2) Structure and function of nucleic acids.

OR

8. Illustrate the structure function correlation of Proteins α -keratin, collagen, and silk fibroin. 18

9. Answer the following (8 Marks each) : 16
- 1) Role of Cyt p450 reductase in drug metabolism.
 - 2) Role of myosin in muscle contraction.

OR

10. Depict the different signaling pathways and describe any one in detail. 16

11. Answer the following (4 Marks each) : 16
- 1) Tests used for monitoring cardiac dysfunction
 - 2) State the role of any two fat soluble vitamins
 - 3) Functions and deficiency of vit C
 - 4) Functions of sodium.

OR

12. Write in brief (8 Marks each) : 16
- 1) Role of any two minerals in the body and its dietary sources.
 - 2) Metabolism of any one branched amino acids.



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**T.E. Biotechnology Examination, 2011
(2003 Course)
BIOSEPARATIONS**

Time : 3 Hours

Max. Marks : 100

SECTION – I

1. What are various methods of cell disruption ? Give an account of chemical method of cell disruption. **16**

OR

2. Write notes on : (**8 marks each**) : **16**
1) Rotor stator homogenizer
2) Enzymatic cell disruption.

3. What is affinity chromatography ? Describe the method with use various ligands. **16**

OR

4. Give detailed account of gas chromatography. Discuss various detectors in gas chromatography. **16**
5. What is the principle of filtration ? Explain types of cross-flow filtration. **18**

OR

6. What are production centrifuges ? Give detailed account of various centrifuges in industry. **18**

SECTION – II

7. What are salient features of biotechnological processes ? How are they applied in down-stream processing ? **16**

OR

8. Give broad classification of biomolecules , outline small biomolecules. **16**

P.T.O.



9. What is crystallization ? Write a note on theory and practice of crystallization. **18**

OR

10. What are the major types of solvent extraction ? Write in detail about liquid-liquid extraction. **18**

11. Name the unit operations involved in primary recovery stage. Describe their roles in primary recovery stage. **16**

OR

12. Describe with the help of flow-sheet production of human insulin. **16**



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**T.E. (Biotechnology) (Semester – I) Examination, 2011
INDUSTRIAL MICROBIOLOGY
(2003 Course)**

Time : 3 Hours

Max. Marks : 100

- N.B. :**
- i) Answer **three** questions from Section I and **three** questions from Section II.*
 - ii) Answers to the **two** Sections should be written in **separate** answer books.*
 - iii) **Neat** diagrams must be drawn **wherever** necessary.*
 - iv) Figures to the **right** indicate **full** marks.*

SECTION – I

1. What are primary and secondary screening methods for isolation and characterization of industrially important microorganisms ? Discuss a case study with respect of screening fungi for antibiotic production. **16**

OR

2. Explain in detail the process of inoculum development. **16**
3. Discuss various steps involved in production of beer. **18**

OR

4. Explain in detail production of glycerol and wine. **18**
5. Write in detail production processes of (any **2**, **8** marks **each**) : **16**
- i) Citric acid
 - ii) Gluconic acid
 - iii) Fumeric and itaconic acid
 - iv) Gibberillic and Kojic acid.

P.T.O.



SECTION – II

6. Explain in detail production process of any antibacterial antibiotics. **16**
- OR
7. Write short notes on : **16**
i) Production of Dextran.
ii) Production of Amino acids.
8. Explain in detail recent advances in industrial microbiology like microbial transformations and bioremediation. **18**
- OR
9. Explain in detail production process of fructose high syrup in detail. **18**
10. What is economics ? On which factors fermentation economics depends ? Explain the factors in detail. **16**
- OR
11. Explain in detail use of different fermenters in detail. Elaborate on some advanced fermenters used to develop production processes using animal cells. **16**
-



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T.E. Biotechnology (Semester– II) Examination, 2011
IMMUNOLOGY
(2003 Pattern)

Time : 3 Hours

Max. Marks : 100

- N.B. :** i) Answer Q. No. 1 or Q. No. 2, Answer Q. No. 3 or Q. No. 4,
Answer Q. No.5 or Q. No. 6, Answer Q. No. 7 or Q. No. 8,
Answer Q. No. 9 or Q. No. 10, Answer Q. No. 11 or Q. No.12.
ii) Answer to the **two** sections should be written in separate
answerbooks.
iii) Neat diagrams must be drawn **wherever** necessary.

SECTION – I

1. With the help of labeled diagram describe the structure of immunoglobulin. Describe the functional role of different classes of antibody. 18
OR
2. Describe the process of inflammation and the role of histamine (source) and mast cells. 18
3. Differentiate and explain the following (**8 m each**). 16
 - a) Primary and secondary immune response.
 - b) Exogenous and endogenous pathways of antigen presentation.OR
4. Describe the role of thymus in T cell maturation. What is meant by negative selection of T cells ? 16
5. Write short notes on (**8 M each**). 16
 - a) Lymphoid organs
 - b) Role of B cells in immunity.OR
6. Write short notes on (**4 M each**) : 16
 - a) T cell activation
 - b) Hybridoma technology
 - c) Adjuvants
 - d) Class I and II MHC molecules.

P.T.O.



SECTION – II

7. Answer the following (**9 M each**) : **18**
a) Describe the process by which a CTL kills its target.
b) Describe the recognition of target cells by Natural Killer T cells.
OR
8. Explain the role of cytokines in differentiation of native T cells and B cells. **18**
9. Define tumor antigens and give their significance in immunology. **16**
OR
10. Answer the following (**8 M each**) : **16**
1) What is the source of β and α interferon, what triggers their presence, and what are their effects ? What does γ interferon do ?
2) Describe the role of mast cells, basophils and eosinophils in allergy.
11. Write notes on (**4 M each**) : **16**
a) Cytokines
b) Blocking auto-antibodies
c) Antigenic drift
d) Ghon complexes.
OR
12. Write notes on (**4 M each**) : **16**
1) Monoclonal antibodies
2) Autoimmunity
3) Cancer antigen
4) Cytokines and chemokines.
-



**T.E. Biotechnology (Semester – II) Examination, 2011
INSTRUMENTATION AND PROCESS CONTROL
(2003 Course)**

Time : 3 Hours

Max. Marks : 100

- N.B :** i) Answer **three** questions from Section **I** and **three** questions from Section **II**.
ii) Answer to the **two** Sections should be written in **separate** answer books.
iii) **Neat** diagrams should be drawn **whenever** necessary.
iv) Figures to the **right** indicate **full** marks.
v) **Use** of electronic pocket calculator is **allowed**.
vi) Assume **suitable** data, if necessary.

SECTION – I

1. a) Describe the operating principle, construction and working of an optical pyrometer. **8**
b) Explain quartz crystal thermometer, its advantages and disadvantages. **8**

OR

2. a) Explain construction and working of Pirani vacuum gauge. **8**
b) Give an overview of the advantages and disadvantages of Electromagnetic flow meter. **4**
c) Describe the working of a level gauge. **4**
3. a) Consider a stirred tank reactor. The reaction taking place is
 $A \longrightarrow B$
and it proceeds at a rate of $r = KC_0$. Assuming constant density and volume V , derive the transfer function relating the concentration in reactor to the feed stream concentration. **8**
b) A thermometer having first order dynamics is placed in a temperature bath at 50°C . After the thermometer reaches equilibrium with the bath, the bath

P.T.O.

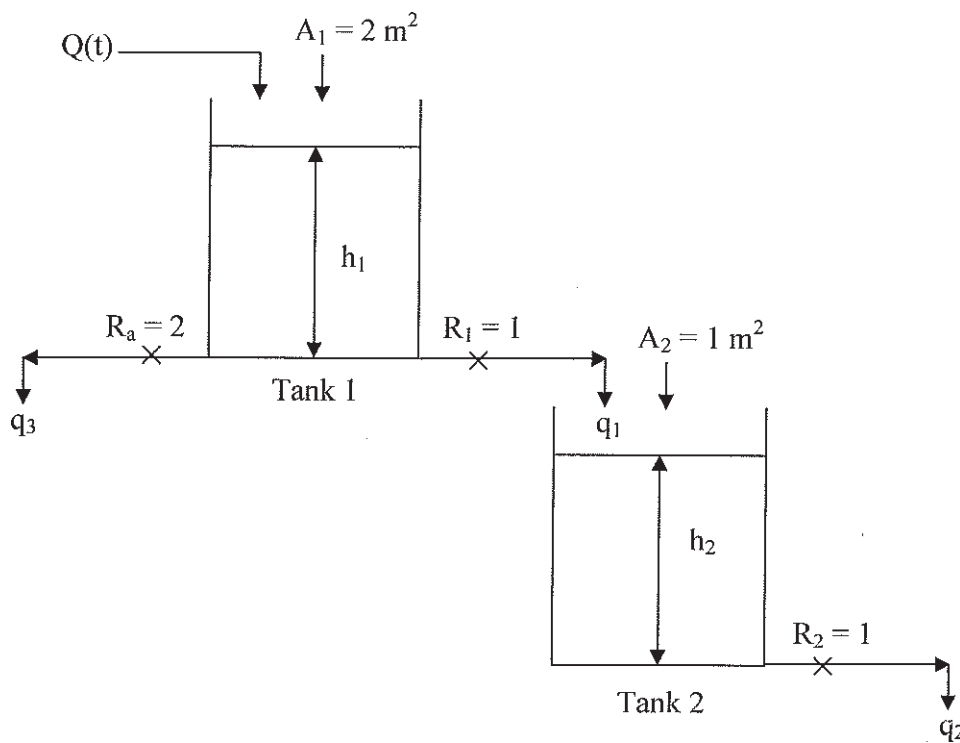


temperature is subjected to sinusoidal forcing function about its average temperature of 50°C with amplitude of 10°C . If the period of oscillation is 3 second cycle and the time constant of thermometer is 10 sec, find out

- i) Amplitude ratio
- ii) Phase angle
- iii) Maximum and minimum temperature indicated by the thermometer. **10**

OR

4. a) Derive the transfer function $H_1(s) / Q(s)$ and $H_2(s) / Q(s)$ for the liquid level system shown in figure. The resistances are linear and $R_1 = R_2 = 1$. **10**



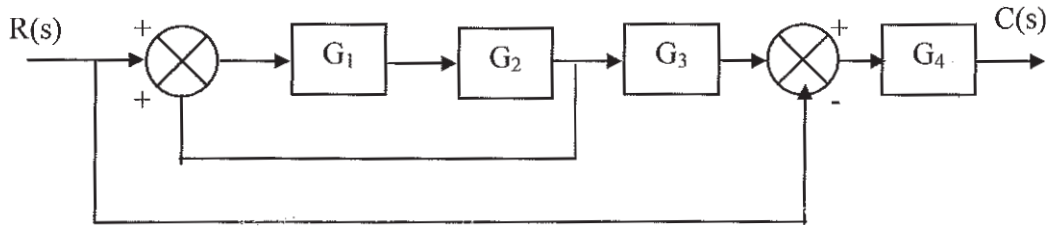
- b) With help of neat diagrams, define the following :

- i) Overshoot
- ii) Decay ratio
- iii) Rise time
- iv) Period of oscillation.

8



- 5. a) What are the different types of controllers used in the process industries ? Explain the action of each controller and compare their performance. 8
- b) Determine the overall transfer function $C(s) / R(s)$ for the system shown in the following figure : 8



OR

- 6. a) The open loop transfer function of the system is given as,

$$G(s) = \frac{Kc \left[1 + \tau_D s + \frac{1}{\tau_I s} \right]}{s(s+2)(s+1)}$$

where $\tau_D = 2$ sec, $\tau_I = 1$ sec. Determine the stability of the control system using Routh's test. 8

- b) Draw the block diagram of a process control system and describe the individual components. 8

SECTION – II

- 7. a) The open loop transfer function of a control system is given by

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

Draw root locus for the system. 9

- b) Draw a Bode plot for the non-interacting systems having the transfer function :

$$G(s) = \frac{1}{(2s+1)(5s+1)}$$

What is the significance of this plot ? 9

OR

- 8. a) What is meant by tuning ? Explain the different tuning rules used in practice. 9
- b) Describe the procedure for plotting a root locus diagram. 9



9. a) With the help of a neat block diagram, describe the cascade control system. Give applications. **8**
- b) Write short notes on : **8**
- i) Ratio control
 - ii) Override control.
- OR
10. a) What are the drawbacks of feedback control systems ? How are they overcome ? **8**
- b) Write notes on : **8**
- i) Selective control system
 - ii) Split range control.
11. Write short notes on (**any four**) : **16**
- a) Gas supply measurement and control in fermentation
 - b) Fuzzy logic
 - c) Weight and Pressure sensors
 - d) Foam measurement and control
 - e) Online measurement of biomass
 - f) Adaptive control



T. E. (Semester – II) (Biotechnology) Examination, 2011
COMPUTATIONAL TECHNIQUES AND PROCESS MODELLING
(2003 Course)

Time : 3 Hours

Max. Marks : 100

- Instructions :**
- 1) Figures to the **right** indicate **full** marks.
 - 2) Use of pocket electronic calculator is **allowed**.
 - 3) Draw a **neat** sketch **wherever** necessary.
 - 4) Assume suitable data if **necessary**.
 - 5) Answer **any three** questions from Section **I** and **any three** questions from Section **II**.
 - 6) Answer to the **two** Sections should be written on **separate** answer sheets.

SECTION – I

- 1 a) Solve by Guass - Siedal method

$$5x - 2y + z = 4$$

$$7x + y - 5z = 8$$

$$3x + 7y + 4z = 10.$$

8

- b) Find the Eigen values and Eigen vectors of the matrix.

$$\begin{bmatrix} 3 & 2 & 4 \\ 2 & 1 & 1 \\ 3 & 3 & 5 \end{bmatrix}.$$

8

OR

2. a) Find the characteristic equation and Eigen values for

$$\begin{bmatrix} 10 & -2 & 1 \\ -2 & 10 & -2 \\ 1 & -2 & 10 \end{bmatrix}.$$

10**P.T.O.**



b) Define the following: 6

i) Characteristic equation

ii) Eigen values

iii) Eigen vectors

3. a) Fit a second degree parabola to the following data of the form $y = ax^2 + bx + c$. 8

X	1	2	3	4	5	6	7	8	9
----------	---	---	---	---	---	---	---	---	---

Y	2	6	7	8	10	11	12	14	16
----------	---	---	---	---	----	----	----	----	----

b) By using Newton-Raphson method, find a root of $1/\sqrt{46}$. 8

OR

4. a) Apply Trapezoidal method for the following data.

X	0	1	2	3	4	5	6
----------	---	---	---	---	---	---	---

Y	1	0.5	0.2	0.1	0.058	0.038	0.027
----------	---	-----	-----	-----	-------	-------	-------

b) Using Euler's method solve for y at $x = 0.1$ from $\frac{dy}{dx} = x + y$ taking $y(0) = 1$ and $h = 0.025$. 8

5. a) Construct forward difference table for the following data and hence evaluate $\Delta^2 f(2)$. 9

x	2	3	4	5
----------	---	---	---	---

y	8	27	64	125
----------	---	----	----	-----

b) Evaluate $\Delta^2 \text{Cos}(2x)$ 9

OR



6. a) Find the missing values in the following table. **9**
- | | | | | | | | |
|----------|----|----|---|----|----|---|----|
| x | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| y | 13 | 21 | - | 43 | 57 | - | 91 |
- b) Express $x^2 + 5x - 7$ as a factorial polynomial and find the differences of all orders. **9**

SECTION – II

7. a) Explain in detail the principles of formulation of mathematical model. **10**
- b) Explain the following terms : **8**
- i) Phase equilibria with equation
 - ii) Chemical equilibria.

OR

8. A fluid of constant density ρ is pumped into a conical shaped tank of total volume $\frac{H\pi R^2}{3}$. The flow out of the bottom of the tank is proportional to the square root of height of the liquid in the tank H . Write the modeling equations for the system and show that the system is critically specified. **18**
9. Derive the modeling equations for a Batch distillation column with a neat sketch and necessary assumptions. **16**

OR

10. Derive the modeling equations for a plug flow reactor in which chemical reaction with simultaneous mass transfer takes place ? **16**
11. Give short notes on : **16**
- i) Cybernetic models
 - ii) Activated sludge systems.

OR

12. Define unlimited cell growth kinetics. Write the modeling equations for a continuous culture for unlimited growth reactors ? **16**



[4063] – 16

T.E. (Semester – II) (Mechanical) Examination, 2011
TRANSMISSION SYSTEM DESIGN
(2003 Course)

Time : 4 Hours

Max. Marks : 100

- Instructions :** 1) *All questions are compulsory.*
2) *Answers to the two Sections should be written in separate books.*
3) *Neat diagrams must be drawn wherever necessary.*
4) *Black 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

Unit – I

1. a) Derive the expression for the equivalent load for the rolling contact bearing operating under cyclic loads in usual notations. **5**
b) What are the basic principles to be followed in bearing mounting ? **3**
c) Find the dynamic capacity of the ball bearing subjected to a varying cyclic load from the manufacturer's catalogue based on 90 % reliability. The expected life of bearing is 10,000 hours with reliability of 95 %. The bearing with inner race rotating and having a 12 second work cycle as under. Assume radial load factor as 0.56 and axial load factor as 1.5 for all elements. **10**

Element No.	Time for each element of cycle	Type of load	Radial load (N)	Axial load (N)	speed (rpm)	Shock and service factor
1	3 sec	Heavy shock	500	700	550	3
2	5 sec	Moderate shock	800	465	900	2
3	Remaining	Light shock	300	275	750	1.5

use the relation for reliability analysis $L = 4.48 L_{10} \left[\ln \left(\frac{1}{R} \right) \right]^{1.5}$.

OR

P.T.O.



2. a) What do you understand by rating and median life of the bearing ? 4
- b) Write short note on Lubrication of bearing. 4
- c) A shaft transmits 5.75 KW power at 2880 rpm from motor to the compressor through a helical gear arrangement having velocity ratio of 6 : 1 as shown in figure 1. A gear is mounted at the centre of the shaft 'AB' of the compressor. The shaft is supported on deep groove ball bearings at both ends A and B. The centre distance between bearings is 200 mm. The required reliability of the bearing is 95 % with life of 8000 hours. Find the dynamic capacity of the bearing, when the bearings with inner race rotating are selected from the manufacturer's catalogue, which lists dynamic capacity at 90 % reliability. Use following data : 10

Size of module = 4 mm

No. of teeth on pinion = 20

Normal pressure angle = 20°

Left hand helix angle on pinion = 23°

Shock load factor = 1.25

Radial load factor = 0.56

Thrust load factor = 1.20

$$L = 4.48 L_{10} \left[\ln \left(\frac{1}{R} \right) \right]^{1.5} .$$

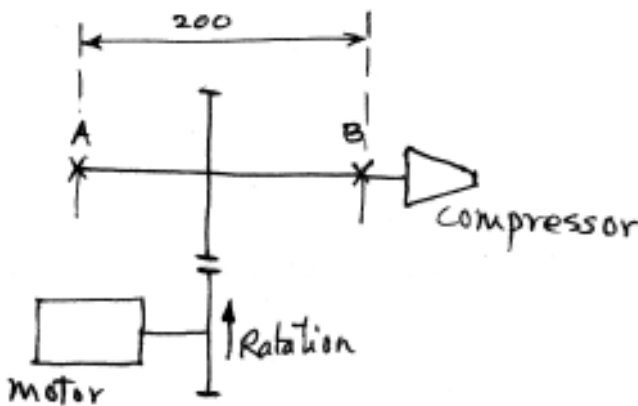


Figure. 1 (Que. No. 2 c)



Unit – II

3. a) An engine develops 25 KW power at 1500 rpm. A plate clutch is to be designed for maximum power transmission capacity on the basis of uniform wear condition. The maximum pressure intensity between the surfaces is 0.1 N/mm^2 . Take coefficient of friction to be 0.35. Calculate the face width of the friction lining, if the outside diameter of contact surfaces is limited to 260 mm. State the axial load required to produce the required torque by the springs and average pressure intensity between the surfaces. Also suggest the type of plate clutch suitable for this engine. Assume that design torque is 10 % more than rated torque. 12
- b) What is self energizing brake ? Derive a condition for block shoe brake. 4
- OR
4. a) Justify the statement that, the uniform wear theory is generally preferred in the design of clutch even if the clutch is relatively new. 4
- b) An internal expanding shoe brake as shown in figure 2 is to be used for a four wheeled vehicle. It is actuated by a hydraulic cylinder that exerts the same force P on each shoe. The shoes are identical and have a face width of 40 mm asbestos friction linings. The maximum pressure intensity for asbestos lining is 0.8 MPa and the coefficient of friction between the linings and drum is 0.4. Find : 12
- i) the braking torque on leading shoe
 - ii) maximum pressure on trailing shoe
 - iii) braking torque capacity of brake.

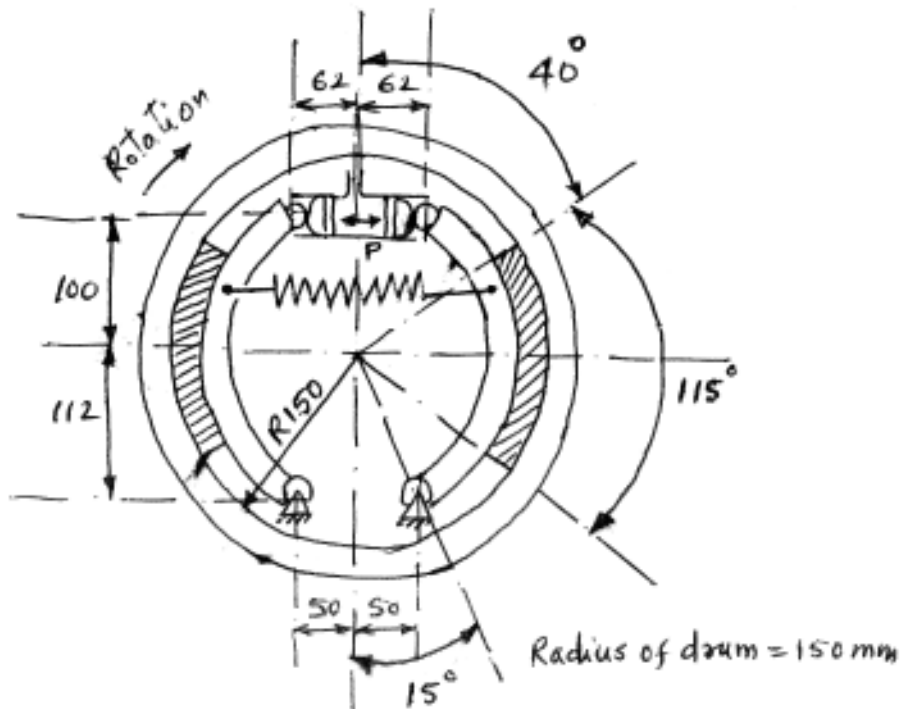


Figure 2 (Que. No. 4 b)



Unit – III

5. a) Prove that, the maximum power transmitted by the belt at given initial tension T_i .

$$P \text{ (Kw)} = \frac{(T_1 - T_2)}{1000} \sqrt{\frac{T_i}{3m}}$$

where T_1 and T_2 – Tension in tight and slack side (N) m - Mass per unit length of belt (Kg/m).

4

- b) Design a flat belt (open type) drive to transmit 10 Kw from a pulley 900 mm diameter to a pulley 1200 mm diameter, having a centre distance of 3600 mm and a belt speed of 20 m/s. Take the coefficient of friction for both pulleys as 0.3, a slip of 1.2 % at each pulley and 5 % friction loss at each shaft. Assume 20 % overload. Belt specification are

- Belt thickness - 12 mm
- Density of belt material - 0.9 gm/cc
- The maximum allowable belt stress - 2 MPa
- Standard belt width in mm
 - 40, 44, 50, 63, 76, 90, 100, 125, 152

Also calculate length of belt and initial tension required in the belt.

12

OR

6. a) Describe the procedure for selection of V belt from manufacturer's catalogue. 6
- b) What are inverted tooth chain ? Sketch and explain their advantages over roller chains. 5
- c) Write short note on construction and lay of wire ropes with sketch. 5

SECTION – II

Unit – IV

7. A spur gear pair is used to transmit 7.5 KW power from an electric motor running at 1440 rpm to a machine at 370 rpm. The pinion and gear are made of plain carbon steel with $s_{ut} = 720 \text{ N/mm}^2$ and steel with $s_{ut} = 600 \text{ N/mm}^2$ respectively. The tooth system is 20° full depth involute and no. of teeth on pinion assumed to be 18. The service factor and load concentration factor are 1.25 and 1.2 respectively. The factor of safety is 1.2 while face width is $12 \times$ module. The gears are machined to meet the specification of Grade 7.



Design the gear pair by using velocity factor $C_v = \frac{3}{3+V}$ and Buckingham's equation for dynamic load. Also suggest the surface hardness of gear pair. Use following data :

- $Y = 0.484 - \frac{2.87}{z}$
- Load stress factor $K = 0.16 (\text{BHN}/100)^2 \text{ N/mm}^2$
- For grade – 7 – $e = 11.0 + 0.9 [m + 0.25 \sqrt{d}]$, μm
- Deformation factor = $0.111 e \left[\frac{E_p E_g}{E_p + E_g} \right]$, N/mm
where $E_p = E_g = 210 \times 10^3 \text{ N/mm}^2$
- Buckingham's equation $P_d = \frac{21v(bc + Pt_{\max})}{21v + \sqrt{bc + Pt_{\max}}}$, N
- Std. Module – 1, 1.25, 2, 3, 4, 5, 6, 8, 10, 12 and 16.

18

OR

8. a) What are the effect of increasing or decreasing pressure angle in design of gear ? **4**
- b) What is addendum modification in gear, state the advantages and limitation of it ? **4**
- c) A spur gear pair with 20° full depth involute teeth consist of 20 teeth pinion meshing with 41 teeth gear. The module 3 mm while the face width is 40 mm. Material for both pinion and gear are steel with $sut = 600 \text{ N/mm}^2$. The gears are heat treated to a surface hardness of 400 BHN. The pinion rotates 1450 rpm and service factor 1.75. Assume velocity factor accounts for dynamic load. Determine the rated power that the gear can transmit,
Use following data :

- Lewis form factor $Y = 0.484 - \frac{2.87}{z}$
- Load stress factor $K = 0.16 \left[\frac{\text{BHN}}{100} \right]^2$, N/mm^2
- Assume factor of safety – 1.5.

10



Unit – V

9. a) What is the relationship between transverse and normal pressure angle and helix angle ? 2
- b) State two advantages and disadvantages of herringbone and double helical gear, also draw the sketches. 4
- c) A pair of helical gears consist of 20 teeth pinion meshing with 100 teeth gear. The pinion rotates at 720 rpm. The normal pressure angle is 20° while the helix angle 25° . The face width is 40 mm and the normal module is 4 mm. The pinion as well as gear are made of steel 40C₈ (sut – 600 N/mm²) and heat treated to a surface hardness of 300 BHN. The service factor and factor of safety are 1.5 and 2.0 respectively. Assume velocity factor accounts for dynamic load and calculate power transmitting capacity of gear.
Use following data :
- $Y = 0.484 - \frac{2.87}{z^1}$
 - $K = 0.16 \left(\frac{\text{BHN}}{100} \right)^2, \text{ N/mm}^2$
 - Ratio factor $Q = \frac{2 Z_g}{Z_g + Z_p}$
 - Velocity factor, $C_v = \frac{5.6}{5.6 + \sqrt{V}}$. 10

OR

10. a) What are the different methods of mounting of bevel gear ? Explain any one with sketch. 3
- b) A pair of bevel gears mounted on shaft that are intersecting at right angle consist of 24 teeth pinion meshing with 32 teeth gear. The pinion shaft is connected to an electric motor developing 12.5 KW rated power at 1440 rpm. The starting torque of motor is 150 % of rated torque. The pressure angle is 20° . Both the gears are made of hardened steel with $S_{ut} = 750 \text{ N/mm}^2$. The gear teeth are generated and finished by grinding and lapping to meet the requirement of class – 3 grade. The factor of safety in preliminary design is 2.



- 1) In initial design assume velocity factor accounts dynamic load with pitch live velocity 7.5 m/s. Estimate module based on beam strength.
- 2) Calculate dimensions of Gear pair.
- 3) Determine dynamic load by Buckingham's equation. Find factor of safety against bending for $C = 11400 \times e \text{ N/mm}^2$.
- 4) Specify the surface hardness no. assume factor of safety – 2.

Use following data :

- $Y = 0.358$ for 24 teeth bevel pinion.
- Error for class – 3 gear teeth = 0.0125 mm.
- $P_d = \frac{21 v (bc + Pt)}{21 v + \sqrt{bc + Pt}}$
- First Preference module – 1, 2, 3, 4, 5, 6, 8, 10, 12, and 16. **13**

Unit – VI

11. a) Explain with neat sketch the difference between single-Enveloping and double-Enveloping worm gear pair. **3**
- b) A worm gear pair 2/52/10/4 transmits 10 KW power from an electric motor rotating at 720 rpm to a machine. The worm is right hand and rotates in clockwise direction when viewed from right side. Sketch the arrangement and show the component of tooth forces. The coefficient of friction between worm and worm wheel is 0.04. While the normal pressure angle is 20° . The overall heat transfer coefficient is $20 \text{ W/m}^2 \text{ }^\circ\text{C}$. The temperature rise of lubricating oil above the atmospheric temperature is 50° C . Determine :
- 1) Component of tooth forces acting
 - 2) Efficiency of worm gear pair
 - 3) Minimum surface area of gear box.

Is the drive self locking ? Comment. Assume worm is above the worm gear. **13**

OR



12. a) With neat sketches explain any two types of construction of worm gear. **3**

b) A worm gear pair 2/30/10/8 consist of worm gear made of phosphor Bronze with $S_{ut} = 245 \text{ N/mm}^2$ and worm made of hardened steel with $S_{ut} = 750 \text{ N/mm}^2$. The coefficient of friction between the worm and worm wheel is 0.04, while the normal pressure angle is 20° . The wear factor of worm gear teeth is 0.825 N/mm^2 . The fan is used for which overall heat transfer coefficient is $22 \text{ w/m}^2 \text{ }^\circ\text{C}$. The permissible temperature rise of lubricating oil above atmospheric temperature is 45° C . The worm rotates at 720 rpm. Assume service factor 1.25. Determine input power rating based on,

- 1) Beam strength
- 2) Wear strength
- 3) Thermal consideration.

Suggest the input power that the worm can take.

Use following data :

- Lewis form factor $Y = 0.484 - \frac{2.87}{Z_g}$
- C_V (Velocity factor) = $C_v = \frac{6}{6 + V_g}$
- Area of housing $A = 1.14 \times 10^{-4} \times a^{1.7}, \text{ m}^2$

where a = centre distance (mm).

13



[4063] – 17

T.E. (Mechanical) (Semester – II) Examination, 2011
TRIBOLOGY
(2003 Course)

Time : 3 Hours

Max. Marks : 100

- Instructions :* 1) Answers to the **two** Sections should be written in **separate** books.
2) **Neat** diagrams must be drawn **wherever** necessary.
3) **Black** figures to the **right** indicate **full** marks.
4) **Assume** suitable data, if **necessary**.

SECTION – I

UNIT – 1

1. a) Write a short note on SAE grades of lubricating oil. **6**
b) Explain different additives used to improve the properties of lubricating oil. **6**
c) What do you understand by the term viscosity index ? How is it measured ? **4**

OR

2. a) Explain any two lubrication system used in I.C. Engines. **6**
b) Explain the significance of 'Tribology' while designing various machine elements. **6**
c) State important desirable properties of lubricating oil. **4**

UNIT – 2

3. Write notes on : **16**
a) Causes of friction
b) Stick-slip friction
c) Erosion
d) Archard theory of wear.

OR

4. a) What is wear debris analysis ? State its importance. **6**
b) Explain in short any two friction measurement methods. **6**
c) Give two examples each, when
1) Wear is desirable **2) Wear is undesirable. 4**

P.T.O.



UNIT – 3

5. a) Discuss the advantages, limitations and applications of Hydrodynamic bearings. 8
- b) Derive the one dimensional Reynolds equation. Also state the assumptions while deriving. 10

OR

6. a) Compare infinitely long journal bearing with infinitely short journal bearing. Also draw sketches showing pressure distribution. 8
- b) The following data is given for a 360° hydrodynamic bearing : (Use table 1) : 10
- Radial load 3.2 kN
 Journal diameter 50 mm
 Bearing length 50 mm
 Journal speed 1490 rpm
 Radial clearance 50 microns
 Viscosity of lubricant 25 cp
 Density of lubricant 860 kg/m³
- Calculate :
- i) The minimum oil-film thickness
 - ii) The coefficient of friction
 - iii) Power lost in friction
 - iv) Total flow rate of lubricant in lit/min
 - v) The side leakage.

Table 1 . Dimensionless Parameters for Full Journal bearings

$\frac{l}{d}$	$\frac{h_0}{c}$	ϵ	$S = \frac{\gamma^2 \mu n_s}{P}$	$\left(\frac{r}{c}\right) f$	$\frac{Q}{r c n_s l}$	$\frac{Q_s}{Q}$	$\frac{P_{max}}{P}$
1.	0.0	1.0	0	0	—	1.0	—
	0.03	0.97	0.00474	0.514	4.82	0.973	6.579
	0.1	0.9	0.0188	1.05	4.74	0.919	4.048
	0.2	0.8	0.0446	1.70	4.62	0.842	3.195
	0.4	0.6	0.121	3.22	4.33	0.680	2.409
	0.6	0.4	0.264	5.79	3.99	0.497	2.066
	0.8	0.2	0.631	12.8	3.59	0.280	1.890
	0.9	0.1	1.33	26.4	3.37	0.150	1.852
	1.0	0.0	∞	∞	3.142	0	—



SECTION – II

UNIT – 4

7. a) What do you understand by “Hydrostatic lubrication” ? Write the important advantages of hydrostatic lubrication over hydrodynamic lubrication. **6**
- b) Derive the equations for pressure distribution and load carrying capacity in case of hydrostatic step bearing. **10**

OR

8. a) Derive the expression for flow of viscous fluid through rectangular slot. **8**
- b) The following data is given for a hydrostatic thrust bearing :
- Supply pressure 5 MPa
 - Shaft diameter 400 mm
 - Recess diameter 250 mm
 - Shaft speed 720 rpm
 - Film thickness 0.15 mm
 - Viscosity of lubricant 30 cp
- Calculate :
- i) load carrying capacity of the bearing
 - ii) flow rate of lubricant
 - iii) frictional power loss
 - iv) pumping power loss. **8**

UNIT – 5

9. a) With the help of practical examples explain the phenomenon of squeeze film action. **6**
- b) Derive the expressions for load carrying capacity and time of approach in case of two parallel circular plates separated by a fluid film. **10**

OR



10. a) Explain the merits, demerits and applications of gas lubrication. **8**
- b) Write notes on :
- i) Lubrication in wire drawing and extrusion
 - ii) Lubrication in rolling. **8**

UNIT – 6

11. a) What are tilting pad bearings ? Why tilting pad bearings are preferred over fixed pad bearings ? What is meant by infinite width tapered pad bearings ? **[2+2+2]**
- b) Derive the following expressions for infinite width tapered-pad bearings :
- i) Pressure distribution
 - ii) Load carrying capacity. **12**

OR

12. Write notes on :
- a) Properties of bearing materials **5**
 - b) Elastohydrodynamic lubrication **5**
 - c) Gaskets **4**
 - d) Oil seals. **4**



T.E. (Mechanical) (Semester – II) Examination, 2011
REFRIGERATION & AIR CONDITIONING
(2003 Course)

Time : 3 Hours

Max. Marks : 100

- Instructions :**
- 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) Black 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

1. a) Explain :

COP, EER, SEER.

6

b) Define 'One Ton Refrigeration'.

2

c) A Bell Coleman refrigerator takes air into compressor at 1 bar, -5°C . It is compressed to 5 bar and cooled to 25°C before entering the expander. Air is expanded to 1 bar. Assuming isentropic efficiencies of compressor and expander to be 82% and 88% respectively, find,

i) Capacity

ii) Power

iii) COP.

Take $C_p = 1.005 \text{ kJ/kgK}$, $r^s = 1.4$.

Assume mass flow rate of air 57 kg/ min. Draw P – V and T – S diagrams.

8

OR

P.T.O.



2. a) Explain regenerative system with a neat sketch and T –S diagram. **6**
- b) Derive an expression for COP or Bell - Colemn cycle. **6**
- c) A refrigerator using Carnot cycle requires 1.25 uW per ton or refrigeration to maintain a temperature of – 30°C. Find
- COP
 - Temperature at which heat is rejected
 - Heat rejection per ton or refrigeration. **4**

UNIT – II

3. a) Explain actual VCR cycle with the help of T–S diagram. **6**
- b) How refrigerants are classified ? **4**
- c) How refrigerant is dry and saturated at suction of a vapour compression plant which operates between –15°C and 40°C respectively. Discharge temperature of refrigerant is 98°C. The bore and stroke of compressor are 85 mm each. It runs at 750 rpm. With volumetric efficiency of 82%. The liquid enters the expansion volve at 32°C . Calculate
- COP
 - Mass flow rate of refrigerant and
 - Capacity.

Use following properties of refrigerant :

Sat. Temp°C	V_g m ³ /kg	h_f (kJ/kg)	h_g (kJ/kg)	S_f (kJ/kgk)	S_g (kJ/kgk)
– 15	0.24	43.4	458.7	0.18	1.742
40	0.043	131	486.6	0.48	1.567

OR

6



4. a) State desirable properties of refrigerants commonly used in refrigeration plants. **6**
- b) What are the limitations of air refrigeration system ? **4**
- c) Explain :
- i) ODP
- ii) TEWI. **6**

UNIT – III

5. a) Explain cascade system with the help of p-h diagram. **6**
- b) What is a multipressure system ? Explain necessity of multipressure system. **4**
- c) A two stage ammonia plant is to achieve a minimum temperature of -40°C when the ambient temperature is 40°C . The intermediate pressure is 3.4 bar . The flash intercooler is employed. Calculate COP and capacity of system if the flow of refrigerant is 0.5 kg/S.
- Also calculate COP and capacity if single stage compression is employed. **8**

OR

6. a) Explain electrolux system with a neat sketch. **6**
- b) Discuss the desirable properties of refrigerant - absorbent mixture of a vapour absorption system. **4**
- c) Derive an expression for COP of an ideal vapour absorption system. Hence calculate percentage change in COP when the generator temperature changes from 150°C to 200°C , refrigeration temperature changes from 20°C to -40°C . Assume that condensation takes place at 30°C . **8**



SECTION – II

UNIT – IV

7. a) Define :

- i) Humidity ratio
- ii) DPT
- iii) Degree of saturation.

6

b) Prove that relative humidity ϕ is given by,

$$\phi = \frac{\mu}{1 - (1 - \mu) \frac{P_v}{P_b}}$$

Where μ = degree of saturation

P_v = partial pressure of water vapour

P_b = barometric pressure.

6

c) Obtain all psychrometric properties of air at 30°C DBT and 15°C WBT.

4

OR

8. a) What is effective temperature ? Explain its significance in the design of air conditioning systems.

4

b) Explain working of air washer with a neat sketch. Explain how various psychrometric processes can be achieved by controlling the spray water temperature.

8

c) A sample of air has DBT and WBT of 35°C and 25°C respectively. The barometric pressure is 760 mm of Hg. Calculate without using psychrometric chart

- i) Humidity ratio
- ii) Relative Humidity and
- iii) Enthalpy.

4



UNIT – V

9. a) Explain ADP and By pass factor. **4**
b) Explain split air conditioning system. **6**
c) Describe different controls used in air conditioning plants. **6**

OR

10. a) What is infiltration and ventilation load ? **4**
b) Explain working of automatic expansion valve. State its limitations. **6**
c) Given for the air conditioning of a room. :
i) Indoor conditions – 26.5°C DBT, 50% RH
ii) RSH Gain = 26.3 kW
iii) RSHF = 0.82

Find the following :

- i) The room latent heat gain
ii) The apparatus dew point
iii) The cmm of air if it is supplied to the room at apparatus dew point. **6**

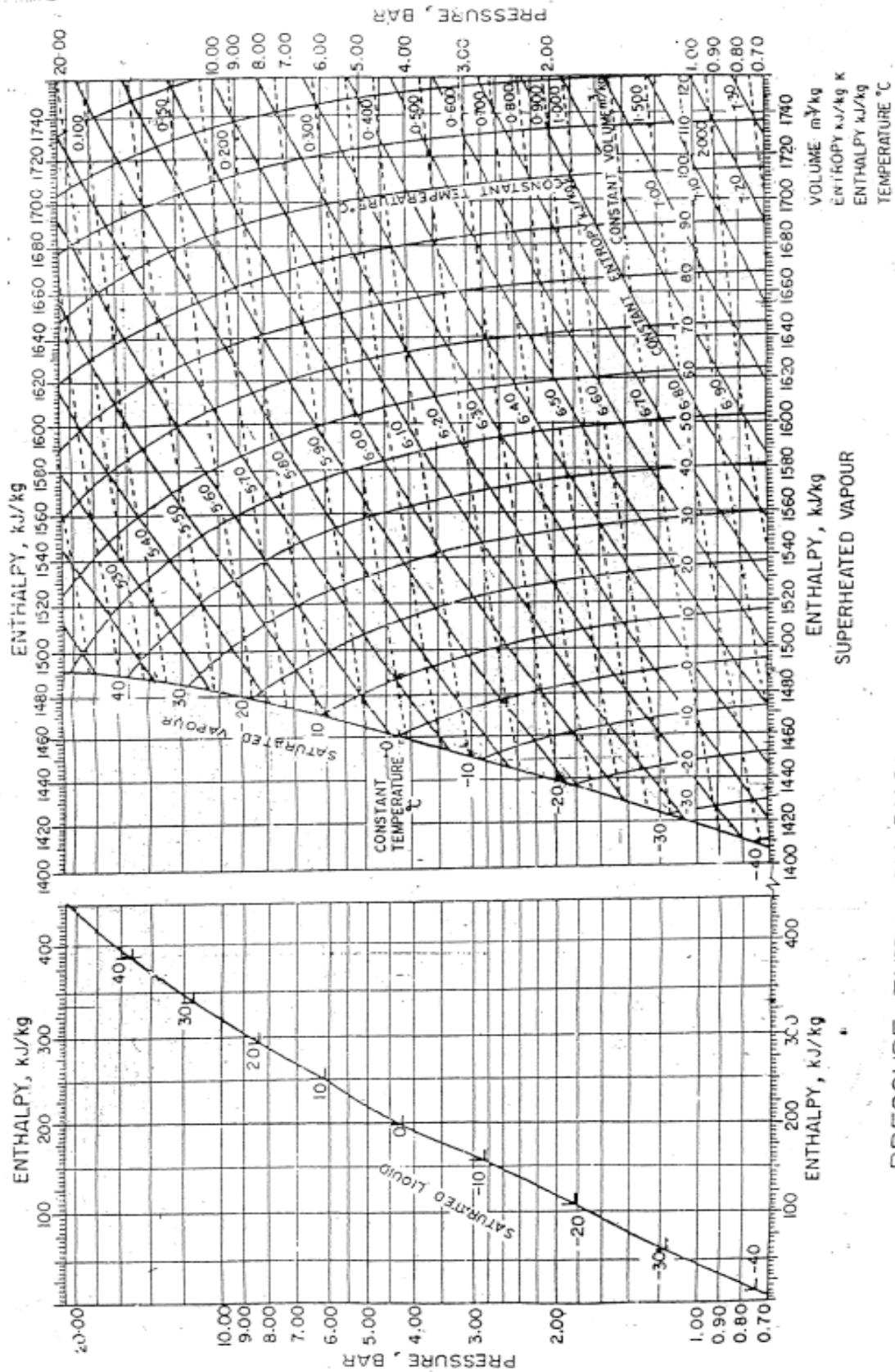
UNIT – VI

11. a) What are the materials used for piping in refrigeration systems ? **4**
b) Write a short note on ‘Cold Storages’. **6**
c) Explain Static Regain method of duct designing. **8**

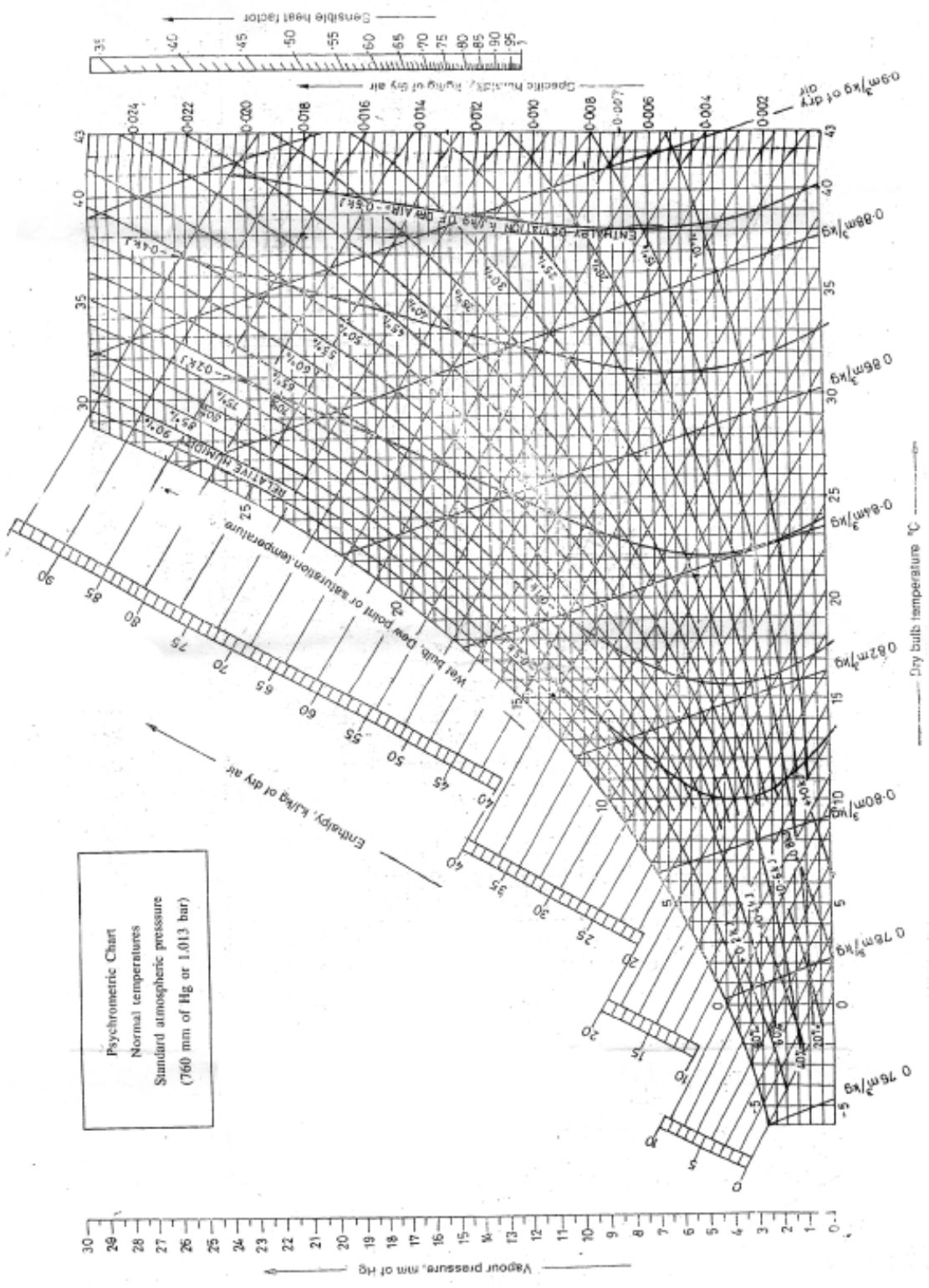
OR



12. a) What is the need to preserve food and vegetables ? Explain factors responsible for spoilage of food and vegetables. **6**
- b) What are the different types of insulating materials used in air conditioning ? What factors are considered in selecting insulating materials ? **6**
- c) A circular duct 40 cm diameter is used in an air conditioning system. The velocity of air is 440 m/ min. If this duct is to be replaced by rectangular duct of aspect ratio 1.5, find out the size of rectangular duct for equal friction method when
- i) The velocity of air in two ducts is same.
 - ii) The discharge rate of air in two ducts is same
- If $f = 0.015$, find out the pressure loss per 100 m length of duct take density of air as 1.15 kg/ m^3 . **6**



PRESSURE-ENTHALPY DIAGRAM REFRIGERANT, AMMONIA (R 717)





[4063] – 2

T.E. Civil (Semester – I) Examination, 2011
(2003 Course)
FLUID MECHANICS – II

Time : 3 Hours

Max. Marks : 100

- Instructions :** 1) Answers to the **two** Sections should be written in **separate** books.
2) Neat diagrams must be drawn **wherever** necessary.
3) Black 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

1. a) Assuming pipe to be rigid derive expression for pressure rise due to water hammer, when valve at the end of pipe is closed :
- i) gradually and completely
 - ii) rapidly and completely. **6**
- b) What are the different types of unsteady flow ? Give two examples where unsteady flow can be converted to equivalent steady state condition. **6**
- c) Explain function, location and types of surge tanks. **6**

OR

2. a) Explain how an aerofoil develops boundary circulation and lift. **6**
- b) Distinguish between :
- i) Stream lined and bluff body
 - ii) Profile drag and deformation drag
 - iii) Circulation and lift
 - iv) Skin friction and form drag. **8**

P.T.O.



- c) An airfoil moving with velocity 100 m/s in air of specific weight 12 N/m² has the following characteristics :
- i) Chord length = 1.2 m,
 - ii) Span = 12 m, and
 - iii) Angle of attack = 6°

If the coefficient of lift and drag is 0.6 and 0.02 respectively determine the weight of airfoil and power required to drive it. 4

3. a) A Jet of water of diameter 7.5 cm, moving with velocity of 12 m/s strikes a series of flat plates placed on the periphery of wheel which rotates at 100 rpm. Calculate : 6
- 1) Force exerted by jet on plate
 - 2) Work done on plate per second
 - 3) Torque exerted on wheel if radial distance between jet striking the plate from axis of wheel is 75 cm.

- b) Derive an expression for force of jet impinging on a moving plate and compare it with force of jet when it strikes on a series of moving vanes. Also compare their efficiencies. 10

OR

4. a) An inward flow turbine has a radial discharge develops 3000 KW under a head of 33 m and has an overall efficiency of 82%. The peripheral velocity of wheel is $0.95\sqrt{2gH}$, velocity of flow is $0.30\sqrt{2gH}$. If the wheel is to make 315 rpm and hydraulic losses are 12%, determine

- 1) Discharge
- 2) Guide blade angle
- 3) Vane angle at inlet and
- 4) Diameter of wheel at inlet. 8

- b) Derive an expression for unit speed, unit power and unit discharge for a turbine. 6

- c) Discuss **any one** of the following : 2

- 1) Hydraulic efficiency
- 2) Overall efficiency



5. a) With a neat diagram of operating characteristics of
- 1) Pelton turbine and
 - 2) Francis turbine, discuss the importance of these curves. 8
- b) A pelton wheel develops 10,000 KW, under a head of 350 m with an overall efficiency of 85% when revolving under a speed of 292 rpm. Find the unit discharge, unit power, and unit speed. Take peripheral coefficient 0.46. If the head on same turbine falls to 260 m, find discharge, power and speed for this head. 8

OR

6. a) Derive the formula for :
- 1) Impeller diameter
 - 2) Minimum starting speed
 - 3) Maximum height of setting of a centrifugal pump. 6
- b) Derive an equation for specific speed of an centrifugal pump. 4
- c) A centrifugal pump is discharging 150 lps at a speed of 3300 rpm against a head of 16.8 m. The impeller diameter is 210 mm and width 50 mm. If the manometric efficiency is 75% determine the vane angle at outer periphery. 6

SECTION – II

7. a) State factors affecting Manning's N and explain their effect on Manning's N. 6
- b) Show that a trapezoidal section of given roughness, bed slope and side slope is hydraulically most efficient when hydraulic radius is half depth of flow. 8
- c) Explain :
- i) Hydraulic exponent for critical flow
 - ii) Specific force. 4

OR

8. a) Show that for a given discharge specific force in a channel is minimum for critical flow. 6
- b) Discuss various cases of variation of flow over hump with neat sketch. 6
- c) A rectangular channel 4.5 m wide carries a discharge of 12.5 m³/sat a depth of 1.30 m. 1) What is the critical depth ? 2) What is the specific energy ? 3) Is the flow subcritical or super critical ? 4) Find the alternate depth to depth of 1.30 m. 6



9. a) A rectangular channel 750 mm wide carries a discharge of 150 lps at a depth of 400 mm. Calculate minimum width of throat to produce a standing wave. If instead of reducing width a hump is provided, calculate minimum height of hump so that critical depth occur on hump. **8**
- b) What is channel transition ? What are the types of transition ? Discuss with neat sketch the transition with reduction in width. **8**

OR

10. a) A rectangular channel 6 m wide conveys water at $11.5 \text{ m}^3/\text{s}$ at a depth of 0.30 m. If hydraulic jump occurs find, **8**
- 1) Depth of flow after jump
 - 2) Power Dissipated in jump
 - 3) Froude number before and after jump
 - 4) Height of jump.
- b) Explain graphical determination of energy dissipation in hydraulic jump for flow below sluice gate. **4**
- c) Classify hydraulic jump based on Initial Froude number and also give the percentage energy dissipated in each case. **4**
11. a) Explain the term Hydraulic jump. Derive an expression for hydraulic jump in terms of upstream Froude number. **8**
- b) Derive the differential equation for gradually varied open channel flow. State the assumptions made. **8**

OR

12. a) Sketch possible flow profile in the following case : **4**
- 1) Steep slope followed by mild slope followed by steep slope which ends in drop.
 - 2) Mild slope followed by steep-slope followed by weir.
- b) What are control section and their significance ? **2**
- c) A Rectangular channel 16 m wide carries water with a normal depth of 3.25 m, bed slope 1 in 3500. A weir downstream rise the water depth to 4.85 m. Determine how far opstream of this section the depth of flow will be within 10% of normal depth. Use step method and take 2 steps, sketch and classify flow profile. Take Manning's $N = 0.016$. **10**



[4063] – 20

**T.E. (Mechanical) (Semester – II) Examination, 2011
METROLOGY AND QUALITY CONTROL (2003 Course)**

Time : 3 Hours

Max. Marks : 100

- Instructions** : 1) Answer **any three** questions from **each** Section.
2) Answer to the **two** Section 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 log tables, electronic pocket calculator is **allowed**.

SECTION – I

1. a) Determine the actual dimension to be provided for a shaft and hole of 90 mm size for H8e9 type clearance fit. Size 90 mm falls in diameter steps of 80 mm and 100 mm.
- Value of tolerance unit $i = 0.45 \sqrt[3]{D} + 0.001D$
 - Value of tolerance for IT 8 & IT 9 grades are 25 i & 4 i. Value of fundamental deviation for 'e' type shaft is $-11 D^{0.41}$. Also design the 'GO' and 'NO GO' gauges.
- Take wear allowance equal to one tenth of gauge tolerance. **10**
- b) Explain the following terms : **6**
- i) Systematic Errors.
 - ii) Random Errors.
2. a) Distinguish between Accuracy and Precision. **4**
- b) Distinguish between 'Line standards' and 'End standards'. **4**
- c) What is straightness ? Describe the procedure to test the straightness using Autocollimator. **8**

P.T.O.



3. a) Explain with neat sketch the method of checking effective diameter of screw thread plug gauge by using Floating Carriage Micrometer. Which corrections should be considered while measuring the effective diameter ? **8**
- b) How magnification is achieved in the sigma comparator ? Also state the salient features of sigma comparator. **8**
4. a) List the various method to measure the gear tooth thickness and explain constant chord method in detail. **8**
- b) Explain the following terms and their significance :
- i) Maximum peak to valley height of roughness. **2**
 - ii) R.M.S. value. **2**
 - iii) C.L.A. value. **2**
 - iv) M system and E system. **2**
5. Write a short note on following (**any 3**) : **18**
- i) Tool makers microscope
 - ii) CMM
 - iii) Parkinson Gear Tester
 - iv) Optical flats
 - v) Alignment test on Milling machine.

SECTION – II

6. a) What is Statistical Quality Control (SQC) ? What are the benefits of SQC ? **3**
- b) Explain the following terms : **9**
- i) Quality of Design
 - ii) Quality of Conformance
 - iii) Quality of Performance.
- c) Write a short note on ‘Optimization of Quality Costs’. **4**
7. a) State and explain the basic ‘Problem Solving Techniques’ used is Quality Circles. **4**
- b) Explain with the help of O.C. curve.
- i) Producers Risk.
 - ii) Consumer Risk.
 - iii) AQL, IQL, RQL.
- c) Write short note on 9000-2000 standards.



8. a) Where it is desirable to use following charts : 6
- i) \bar{X} and R charts
 - ii) P charts
 - iii) C charts.
- b) Subgroup of 4 items each are taken from a manufacturing process at a regular interval. A certain quality characteristic is measured and \bar{X} and R values are computed. After 20 subgroups it is found that $\sum \bar{X} = 325.50$ & $\sum R = 8.20$. If the specification limits are 13.40 ± 0.30 and if the process is in statistical control what conclusion can you draw about the ability of the process to produce items within specifications. 10
- Given $d_2 = 2.326$.
9. a) Differentiate between ‘sequential sampling plans’ and multiple sampling plan. 4
- b) In a double sampling plan. 9
- $N = 5,000$ $n_1 = 100$, $c_1 = 0$, $n_1 + n_2 = 200$ and $c_2 = 1$.
- i) Compute the probability of acceptance of a 1% defective lot.
 - ii) Assume that a lot is rejected by the proposed sampling plan will be 100% inspected and defectives found in accepted samples not to be replaced. What will be the AOQ if submitted lots are 1% defective ?
 - iii) Consider both the inspection of sample and inspection of rejected lots ; what will be the average number of articles inspected per lot of the submitted product is 1% defective ?
- Given : For $np' = 1$, $c_1 = 0$ $P = 0.368$
 $np' = 1$, $c_1 = 1$ $p = 0.736$.
- c) Explain the term ‘Vendor Rating’. 3
10. Write a short note on **any three** : 18
- i) Six Sigma Concept
 - ii) Total Quality Management
 - iii) JIT and KANBAN
 - iv) Quality Audit
 - v) Control Chart Patterns.



[4063] – 21

T.E. Mechanical Sandwich (Semester – I) Examination, 2011
Elective – I – (1) : WELDING TECHNOLOGY
(2003 Course)

Time : 3 Hours

Max. Marks : 100

- Instructions :** 1) Attempt **one** question of **each** Unit from Section I and Section II.
2) Answer 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

1. a) Explain with neat sketch a temperature distribution around a metallic arc butt weld. **8**
b) Write a note on metallurgical effects of welding. **8**

OR

2. a) Explain the importance of Edge preparation, cleaning of edges, tack welding in welding process. **8**
b) Explain different types of joints in welding. **8**

Unit – II

3. a) Explain with neat sketch MIG welding state their advantages, limitations and applications. **9**
b) Describe different equipments and tool used in arc welding. **9**

OR

4. a) Explain with neat sketch CO₂ arc welding process along with advantages, limitations and applications. **9**
b) Explain with neat sketch TIG welding process with self adjusted arc and self controlled arc. **9**

Unit – III

5. a) Explain oxygen arc cutting along with advantages, limitations and applications. **8**
b) Write note on brazing fluxes and filler metal. **8**

OR

P.T.O.



6. a) Explain plasma arc cutting along with advantages, limitations and applications. **8**
 b) Explain any two methods for soldering. **8**

SECTION – II
Unit – IV

7. a) Explain steps involved in a spot resistance welding. **6**
 b) Write note on : **10**
 i) seam welding ii) projection welding
 OR
8. a) Explain with neat sketches for different flames in gas welding along with advantages, limitations and application. **9**
 b) Explain with suitable sketches a flash Butt welding. **7**

Unit – V

9. a) With neat sketch explain explosive welding along with advantages, limitations and application. **9**
 b) Explain with neat sketch forge welding along with their advantages, limitation, application. **9**
 OR
10. a) With neat sketch explain electron beam welding along with advantages, limitations and application. **9**
 b) Explain in short two techniques for lap and butt-welding. **9**

Unit – VI

11. a) Explain weld quality along with factors to be considered for weld quality. **8**
 b) Write note on : **8**
 i) ultrasonic testing ii) weld cost
 OR
12. a) Define weldability. Explain different factors affecting on weldability. **6**
 b) Explain any two destructive testing for testing of a welded part. **10**



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T.E. (Mechanical) (Semester – II) Examination, 2011
METROLOGY AND QUALITY CONTROL ((2008 Pattern))

Time : 3 Hours

Max. Marks : 100

- Instructions :**
- 1) Attempt **any one** question in **each** Unit.
 - 2) Answer **3** questions from Section **I** and **3** questions from Section **II**.
 - 3) Black figures to the **right** indicate **full** marks.
 - 4) Assume suitable data, if necessary.
 - 5) Solve **1** or **2**, **3** or **4**, **5** or **6**, **7** or **8**, **9** or **10**, **11** or **12**.
 - 6) Answer to the Sections **I** and **II** should be written separately.

SECTION – I

Unit – I

1. a) Differentiate between :
 - i) End standards and Line standards **3**
 - ii) Measurement and Calibration. **3**
- b) Differentiate between Mechanical and Pneumatic comparator. Explain with sketch the principle and working of Solex Pneumatic comparator. **10**
2. a) Sketch the setup and describe the construction as well as operating procedure for Auto-Collimator. **6**
- b) Discuss advantages and limitations of optical comparators. Explain construction and working of optical-mechanical comparator. **10**

Unit – 2

3. a) Design the GO - NO GO limit gauge for checking of a hole having size $40^{+0.04}_{-0.00}$ mm. Assume gauge maker's tolerance equal to 10 % of work tolerance and wear allowance equal to 10 % of gauge maker's tolerance. [Draw the diagrammatic presentation]. **10**
- b) Describe how interference bands are formed while using optical flats. Describe with neat sketch the fringe pattern obtained on various surfaces contours using interferometry. **8**

P.T.O.



4. a) Design and make drawing of plug gauge for inspection of a hole of $70 H_8$.
Given data with usual notations :
Tolerance unit = $i = 0.45 \sqrt{D} + 0.001 D$,
Diameter step 50 to 80 mm. **10**
- b) Define terms : (i) CLA Value, (ii) RMS Value. **2**
- c) Describe with neat sketch Tomlinson's surface meter. **6**

Unit – 3

5. a) Derive an expression for best size wire and calculate diameter of best wire for $M_{20} \times 2.5$ screw. **6**
- b) Write short note on : Parkinson gear tester (Draw sketch). **6**
- c) Write a short note on : Machine vision. **4**
6. a) Explain the use of constant chord method. Derive expression as ;
Constant chord = $\left[(\pi \times m \times \cos^2 \phi) / 2 \right]$
Where, m = module and ϕ = pressure angle. **6**
- b) Write short note on Pitch measuring machine (Draw sketch). **6**
- c) Explain use of Lasers in Metrology. **4**

SECTION – II

7. Discuss following seven quality control tools used to support Quality Improvement.
- 1) Check sheet
 - 2) Flow charts
 - 3) Histograms
 - 4) Cause and effect diagrams
 - 5) Pareto Analysis
 - 6) Scatter diagrams
 - 7) Control charts. **18**

OR



- 8. a) Discuss Deming's 14 point for achieving quality excellence. **7**
- b) Explain concurrent Engineering Product development activities. **6**
- c) Discuss Mal com Balbridge award. **5**
- 9. a) Explain with example following process improvement Quality tools
 - a) Kaizen
 - b) Poke Yoke. **8**
- b) Discuss following Quality management concepts.
 - a) 5S
 - b) Kanban. **8**
- 10. a) Discuss Failure Mode and Effect analysis to estimate the effect and seriousness of the failure take example. House hold lamp. **8**
- b) Explain in brief :
 - 1) TS 16949
 - 2) ISO 14000. **8**
- 11. a) Explain five steps in the DMAIC methodology in Green belt training. **5**
- b) Explain six sigma concepts developed by Toyota Motor Corporation. **5**
- c) Explain process capability index. **6**
- 12. a) Differentiate between single sampling double sampling, Multiple sampling, Differential sampling plan. **12**
- b) Explain OC curve. **4**



**T.E. (Mechanical Sandwich) (Semester – I) Examination, 2011
(Elective – I) (2) : MANUFACTURING MANAGEMENT
(2003 Course)**

Time : 3 Hours

Max. Marks : 100

- Instructions :** 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) **Black** 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

1. a) Explain in brief what do you understand by Manufacturing Management. What are various functions of it ? **8**
b) What is production ? What are various value adding conversion process ? Explain. **8**
- OR
2. a) Describe in brief various activities of production planning and control department in industry **8**
b) Explain role of the following in production of an Automobile Manufacturing Industry. **8**
1) Marketing department.
2) R and D department.
3. a) Compare rural and urban site location. State also relative advantages and disadvantages of each location. **8**
b) Explain in brief the following : **8**
1) Fixed cost and variable cost.
2) Make-buy decision.

OR

P.T.O.



4. a) State and explain various factors affecting design of layout of plant. **8**
- b) The manufacturing company is investigating the decision whether to make or buy a plastic packaging which is currently being purchased at Rs.7.00 each. The demand estimates are shown below.

Demand (Units)	20,000	30,000	40,000	50,000	60,000
Chance (%)	10	30	40	15	5

8

The decision to manufacture in-house costs the company an annual fixed cost of Rs. 80,000 towards renovation and conditioning, variable costs are estimated at Rs.5 percent.

Give your decision whether to make or buy. At what quantity it is profitable to produce rather than buy ?

5. a) Explain JIT. What are the limitations and advantages of JIT ? **8**
- b) Describe in brief the following :
- 1) Scheduling Technique.
 - 2) SMED. **10**

OR

6. Write short notes on the following .(any three) **18**
- 1) Planning and Scheduling
 - 2) Line balancing
 - 3) Dispatch rules
 - 4) Kanban Pull System.

SECTION – II

7. a) What is time series analysis ? What are the components of time series ? How the forecast is made from the time series ? **8**
- b) Explain the least square method of forecasting . **8**

OR

8. a) What are major categories of cost associated with stocks ? Explain. **8**
- b) What are the assumptions usually made in EOQ calculations ? Explain. **8**



- 9. a) Define project management. What are the characteristics of project ? 8
- b) Discuss the various stages in the Life Cycle of a project. 8

OR

- 10. a) Following table lists the activities of a maintenance project. Draw the network diagram also find critical path and duration of project activity. 8

Activity	Duration (in month)	Activity	Duration in month
1 - 2	2	4 - 7	3
1 - 3	2	5 - 8	1
1 - 4	1	6 - 8	4
2 - 5	4	7 - 9	5
3 - 6	5	8 - 9	3
3 - 7	8		

- b) Explain meaning of the following in project Management

- 1) Float
- 2) Critical path
- 3) Crashing of network
- 4) Resource levelling. 8

- 11. a) Define MIS. Explain its need, purpose and objectives. 10
- b) What is Artificial Intelligence ? Differentiate between conventional system and expert system. 8

OR

- 12. Write short note on the following (**any three**) : 18
 - 1) Decision support system.
 - 2) Supply chain Management.
 - 3) Two and three bin systems.
 - 4) Fitting a straight line.
 - 5) Accuracy of forecast.



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T.E. (Mechanical s/w) (Semester – I) Examination, 2011

3) BEHAVIOURAL SCIENCE

(Elective – I) (2003 Course)

Time : 3 Hours

Max. Marks : 100

- Instructions:** 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** books.
4) **Neat** diagrams must be drawn **wherever** necessary.
5) Assume suitable data, **if necessary**.

SECTION – I

1. a) Discuss about the advantages and disadvantages of public limited company. **8**
b) Explain the scope of science involved in Behavioural Science. **8**
2. a) Explain the characteristics of good payment. **8**
b) State the limitation of line organisation. How are they overcome in the line and staff type organisation ? **8**
3. a) How does the style of leadership influence employee motivation ? Discuss with examples. **8**
b) Industrial laws are essential devil-Explain. **8**
4. Write short note on **(any three)** : **18**
 - 1) Organisation structure.
 - 2) Cognitive learning theory.
 - 3) Trade union role.
 - 4) Personality traits.

P.T.O.



SECTION – II

5. a) Differentiate between formal and informal organizations. **8**
b) What is task and social leadership roles ? **8**
6. a) Explain Technical, human and conceptual skills used by leaders. **8**
b) What is Autocratic, consultative and participative leaders ? **8**
7. a) Explain the process of effective listening. **8**
b) Define the purpose and ways to improve downward communication. **8**
8. Write short note on **(any three)** : **18**
- i) Traits of effective leadership
 - ii) Non verbal communication
 - iii) Organization behavior
 - iv) Written communication.



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T.E. (Production/Prod. S/W) (Semester – II) Examination, 2011
NUMERICAL TECHNIQUES AND DATABASES
(2008 Pattern)

Time : 3 Hours

Max. Marks : 100

- Instructions :**
- 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

1. a) Explain the various components of database management system with sketch. **6**
- b) What is 'field' and a 'record' in a database ? Give an example for each. **6**
- c) What are the disadvantages of conventional file system ? **4**

OR

2. a) Draw a neat line diagram of organization of database and explain. **8**
- b) Write short note on following : **8**
 - i) Entity relationship model
 - ii) Data types used in SQL.

UNIT – II

3. a) What is relation ? Design a relation for items stored in store room ? What is the key field in this relation ? **8**
- b) Explain with example primary key and foreign key in database. **4**
- c) What is normalization ? **4**

OR

4. a) Write a SQL syntax to create a table 'empinfo' with the following columns by assuming suitable data types and size with correct syntax in SQL.

First _name, Last _name, Title, Age, Salary. **4**

P.T.O.



- b) Write the correct SQL syntax for following queries :
- i) Select all columns for everyone whose last name contains “de”.
 - ii) Update First_name to Avinash from Ashish
 - iii) Add the field Deptto table ‘empinfo’.
 - iv) Find average salary for all employees whose title is equal to ‘Programmer’. **8**
- c) Explain the following query :
- SQL>SELECT lastname, max(salary), dept FROM employee GROUP BY dept;. **4**

UNIT – III

5. a) What is functional information system ? What are the characteristics of functional information system ? **6**
- b) What is expert system ? Explain in brief the need of expert system in manufacturing. **6**
- c) Explain the following :
 - i) Electronic fund transfer
 - ii) Artificial intelligence. **6**

OR

6. a) Explain the applications of information technology in the following areas of engineering. **12**
 - i) Material requirement planning
 - ii) Inventory management
 - iii) Project management
- b) What is mean by data warehousing ? What are its characteristics ? **6**

SECTION – II

UNIT – IV

7. a) Explain the principles of good programming. **6**
- b) If $r = 3h$ ($h^6 - 2$) find the absolute and percentage error in r at $h = 1$ if percentage error in h is 0.5. **4**



- c) Solve following system of equations by Gauss elimination method correct to three decimal places 8

$$2.10X - 4.50Y - 2.00Z = 19.07$$

$$3.00X + 2.50Y - 4.30Z = 3.21$$

$$-6.00X + 3.50Y + 2.50Z = -18.25$$

OR

8. a) Define round off error. What are the ways to reduce round off errors ? 5
- b) Find the relative and percentage error in computation of $y = x^3 + 3x^2 - x$, for $x = \sqrt{2}$, by taking $\sqrt{2} = 1.414$ error in $X = 0.0005$. 5
- c) Find the root of $4x - e^x = 0$ in the interval $x = 2$ and $x = 3$, correct up to four decimal places by Newton Raphson method. 8

UNIT – V

9. a) Draw a flowchart and write Pseudo C-program for method of moments to fit a straight line $AX+B=Y$. 8
- b) Fit a straight line $Y=AX+B$ to following data. 8

X	71	68	73	69	67	65	66	67
Y	69	72	70	70	68	67	68	64

OR

10. a) By using Lagrange's interpolation, find the age corresponding to the annuity value 13.6 given the table. 8

Age X	30	35	40	45	50
Annuity value Y	15.9	14.9	14.1	13.3	12.5

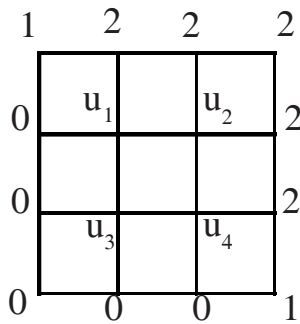
- b) Draw a flowchart and write C-program for Newton forward difference method. 8

UNIT – VI

11. a) Solve the equation $\frac{dy}{dx} = 1 - y$ by using modified Euler method given $y = 0$ at $x = 0$ and hence solve for y at $x = 0.3$. Take step $h = 0.1$. 6



- b) Evaluate the functions $u(x,y)$ satisfying $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$, for the square mesh with boundary values as shown in the following figure. Iterate till mesh values are correct to two decimal places. 6



- c) Classify the following partial differential equations. 4

i) $(1 + x^2)u_{xx} + (5 + 2x^2)4u_{xy} + (4 + x^2)u_{yy} = 0$

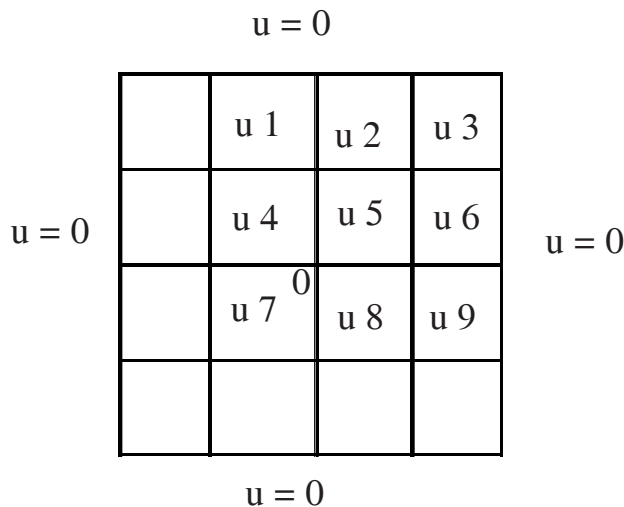
ii) $(x + 1)u_{xx} - 2(x + 2)u_{xy} + (x + 3)u_{yy} = 0$

OR

12. a) Using Runge Kutta method of fourth order, compute y at $x = 0.3$ given 8

$$\frac{dy}{dx} + y + xy^2 = 0, \quad y=0 \text{ at } x = 0. \text{ Take step } h = 0.1.$$

- b) Solve $\nabla^2 u = 8x^2y^2$ for square mesh given $u = 0$ on the 4 boundaries dividing the square into 16 sub-squares of length 1 unit. 8





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T.E. (Semester – I) (Mechanical Sandwich) Examination, 2011
PLANT ENGINEERING Elective – I (4)
(2003 Course)

Time : 3 Hours

Max. Marks : 100

- Instructions :**
- 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) **Black figures** to the **right** indicate **full** marks.

SECTION – I

1. a) What do you understand by Plant Engineering with reference to Function of Location and Layout ? Explain. **8**
- b) Describe the following types of layout with neat sketch **8**
 - 1) Product Layout
 - 2) Process Layout.

OR

2. a) Explain role of Material Handling department and Maintenance department in modern day plant engineering. **8**
- b) Explain advantages and disadvantages of the following : **8**
 - 1) Layout by Fixed Position
 - 2) Cellular Layout.
3. a) What are the characteristics of good plant layout ? Explain. **8**
- b) Describe how analysis for space requirement is performed in layout planning ? What factors involved in it ? **8**

OR

P.T.O.



4. a) Describe in brief the following with reference to plant layout : **8**
1) PQ analysis
2) Group technology.
- b) Describe in detail factors affecting selection of site. **8**
5. a) What factors are considered during selection of Material Handling Equipment ? **8**
- b) Explain the following : **10**
1) Repair cycle analysis in Maintenance
2) Work measurement for maintenance workers.

OR

6. Write short note on the following (**any three**) : **18**
- 1) Productivity
2) Planning for layout
3) REL Chart
4) AGV
5) History Cards.

SECTION – II

7. Describe various safety measures to be taken for any mechanical Industry. Justify your answer with examples. **16**
- OR
8. a) Explain what safety provisions for the following in plant engineering **8**
1) Industrial Pollution
2) Environmental Safety.
- b) Explain how estimation of capacity for auxiliary services are been decided ? Justify answer with suitable example. **8**



9. a) Explain in brief methods adopted for disposal of Scrap and recycle used in industry. **8**
- b) Describe the following with regards to work piece control **8**
- 1) Concept of Location
 - 2) Geometry control.

OR

10. What do you understand by Systems Engineering ? Explain in brief. **16**
11. a) Explain Replacement strategy used in plant evaluation technique. **8**
- b) Describe in brief what do you understand by Modeling of total life cycle cost (L.C.C.). **10**

OR

12. Write short note on the following (**any three**) : **18**
- 1) Techno economic life of plant.
 - 2) Fire fighting equipments.
 - 3) Decision support system.
 - 4) Training in Safety.
 - 5) Role of computers in industry.



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**T.E. Production S/W (Semester – I) Examination, 2011
MANUFACTURING TECHNOLOGY (Self Study)
(2008 Pattern)**

Time : 3 Hours

Max. Marks : 100

- Instructions :** 1) Answer to the **two** Sections should be written in **separate** answer book.
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 table is **allowed**.
5) Assume suitable data, if **necessary**.

SECTION – I

1. a) In EDM process, if in a RC type generator, to get an idle time of 500 μ s for open circuit voltage of 100 V and maximum charging voltage of 70 V, determine charging resistance.
Assume Capacitance, C = 100 μ F. 8
- b) Explain the various parameters affecting Metal removal rate for laser beam machining. 8
- OR
1. a) In ECM operation of pure iron an equilibrium gap of 2 mm is to be kept. Determine supply voltage, if the total overvoltage is 2.5 V. The resistivity of the electrolyte is 50 Ω -mm and the set feed rate is 0.25 mm/min. 12
- b) Compare various conventional and non-conventional manufacturing processes with respect to the materials that are processed. 4
2. Explain following for Plastic Processing : 16
- i) Calendaring
ii) Thermoforming.
- OR
2. Explain various design considerations of plastic processing. 16
3. What is Micro Electro Mechanical Systems (MEMS) ? Explain its typical applications in Advanced Manufacturing Processes. 18

OR

P.T.O.



3. With respect to fabrication of Micro-Electronic Devices, explain 18
- i) Oxidation and Lithography
 - ii) Diffusion and Ion-implantation.

SECTION – II

4. Explain different types of comparators and their function with suitable example. Explain principle, working, advantages and limitations of Mechanical, Electrical, Optical and Pneumatic Comparators. 16

OR

4. For measurement by light wave interference, explain : 16
- i) NPL Flatness interferometer
 - ii) Fringe patterns and their interpretation.

5. Explain principle and applications protractor (optical and bevel), sine bar and angle gauges. 16

OR

5. Explain following **any two** : 16
- i) Autocollimator
 - ii) Angle Dekkor
 - iii) Measurement of Surface Finish.

6. Explain Objectives and functions of cost estimating and principle factors in estimating, along with estimating procedure. 18

OR

6. Write short notes on following (**any three**) : 18
- i) Estimation of volume and weight of material
 - ii) Provision for scrap and its necessity in estimating
 - iii) Methods of Depreciation
 - iv) Replacement Techniques
 - v) Time Value for money.



[4063] – 27

**T.E. (Mechanical S/W) (Semester – II) Examination, 2011
MECHATRONICS
(2003 Course)**

Time : 3 Hours

Max. Marks : 100

- Instructions :** 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**.

SECTION – I

1. a) Explain the following terms :
i) Threshold ii) Sensitivity. **6**
b) Explain with a neat sketch the principle and working of Mcleod gauge. **5**
c) Compare the characteristics of any two pressure measuring devices. **5**

OR

2. a) Distinguish between the following :
i) Accuracy and precision. **6**
ii) Zero drift and sensitivity drift. **6**
b) Explain with a neat sketch the principle and working of Hot wire Anemometer. **5**
c) Explain the various elements in mechatronics system with a block diagram. **5**

P.T.O.



- 3. a) Define Gauge factor of a strain gauge and derive the expression for the same. **8**
- b) Write a short note on :
 - i) Pyrometers
 - ii) RTD. **8**

OR

- 4. a) Compare :
 - i) RTD Vs Thermocouple.
 - ii) PTC Vs NTC Thermistors. **6**
- b) Explain with a neat sketch the working of LVDT. **5**
- c) Write a short note on Load cells. **5**
- 5. a) Differentiate between feedback and feed forward control system. **6**
- b) Explain fluid system building blocks. **6**
- c) Derive the model equation of a translational mechanical system with spring, mass and damper. **6**

OR

- 6. a) Write a short note on electromechanical system model. **6**
- b) Explain electrical system building blocks. **6**
- c) Write a short note on :
 - i) Transfer function
 - ii) Open loop control system. **6**

SECTION – II

- 7. a) Explain dynamic response of first order system to impulse input. **6**
- b) Explain P+I+D control action. **5**
- c) Write a short note on proximity and magnetic switches. **5**

OR



8. a) Explain temperature and level switches. **6**
b) Explain dynamic response of second order system to step input. **5**
c) Write a short note on transfer function. **5**
9. a) Explain op-amp. as a differentiator and integrator. **6**
b) Write a short note on :
i) application of flip flop.
ii) decade counter. **5**
c) Explain Analog to digital converter. **5**
- OR
10. a) Explain sample and hold circuit. **5**
b) Explain inverting and non inverting operational amplifier. **6**
c) Write a short note on schmitt trigger. **5**
11. a) Explain various factors to be considered for selection of PLC. **6**
b) Write a short note on timers and internal relays in PLC. **6**
c) Develop a ladder diagram for an level control application. **6**
- OR
12. a) Explain the various elements of PLC with a neat sketch. **6**
b) Write a short note on micro-controller. **6**
c) Write ladder program for the following logic functions :
i) NOR ii) AND
iii) Exclusive OR **6**
-



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**T.E. (Printing) Examination, 2011
OFFSET MACHINES – 1 (2008 Pattern)**

Time : 3 Hours

Max. Marks : 100

Instructions: 1) *All questions are compulsory.*
2) *Answers to two Sections should be written in separate books.*

SECTION – 1

1. A) What is the purpose plate and blanket cylinder clamping arrangement ? Explain with diagram. 8
- B) Explain with neat diagrams double diameter and triple diameters types of transfer drum. 8

OR

1. Explain the following : 16
- A) Impression cylinder grippers
- B) Cylinder undercut
- C) Cylinder configuration
- D) Cylinder packing material and requirements.
2. A) Explain in brief factors affecting exposing and developing of P.S. plate. 8
- B) Differentiate between Thermal CTP and Violet CTP plate processing. 8

OR

2. A) Explain the role of silver halide layer in CTP plate. 8
- B) Enlist merits and demerits of CTP plate technology. 8
3. A) Explain the different metering system of sheet fed offset inking unit. 9
- B) Explain the purpose of various roller diameters used in offset. 9

OR

3. A) Explain the drum type inking system with diagram. 9
- B) List down various types of inks used in offset machines. 9

P.T.O.



SECTION – 2

4. A) Explain importance of pH, conductivity, surface tension and temperature of F.S. **18**
OR
4. A) With help of diagram explain any two continuous flow dampening system. **9**
B) List advantages and disadvantages of IPA used in F.S. **9**
5. A) Compare IR dryers and UV curing systems. **8**
B) What is 3 point register system ? Explain swing arm gripper. **8**
OR
5. A) Explain various parts in delivery system of offset machine. **8**
B) Explain sequence of operation in stream feeders. **8**
6. A) State the make-ready arrangement for a 4 colour job on a 2 colour machine. **8**
B) Explain waste generated in press room and measures to reduce them. **8**
OR
6. Explain in brief the importance of following press standards for print production. **16**
-



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T.E. (Printing) Examination, 2011
PRINTING NETWORK TECHNOLOGY AND OPTO-ELECTRONICS
(2008 Pattern)

Time : 3 Hours

Max. Marks : 100

- Instructions :**
- 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) **Black** 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

1. A) Explain necessity of modulation. Explain Pulse Amplitude Modulation (PAM). 10
B) Explain data encryption and decryption. 8
OR
2. A) Explain frequency division multiplexing (FDM) and time division multiplexing (TDM). 10
B) Explain quantization and different types of quantization. 8
3. A) Explain different types of fiber optic cable with suitable diagrams. 10
B) Explain application of fiber optic communication in field of printing. 6
OR
4. A) Draw and explain block diagram of basic fiber optic communication system. 8
B) Explain different losses in fiber optic communication. 8
5. A) Explain application of RFID in field of printing. 8
B) Explain different types of RFID. 8
OR
6. A) Explain Wi-Fi technology. 10
B) Explain any one application of optoelectronics in printing. 6

P.T.O.



SECTION – II

- | | |
|--|---------|
| 7. A) Explain different features of MAC operating system. | 8 |
| B) Explain different design issues in network operating system. | 10 |
| OR | |
| 8. A) Explain directory structure of UNIX. | 8 |
| B) Explain following UNIX commands (any five) : | 10 |
| 1) touch | 2) grep |
| 3) head | 4) tail |
| 5) cp | 6) mv |
| 7) cat. | |
| 9. Explain following protocols (any two) : | 16 |
| 1) POP3 | |
| 2) FTP | |
| 3) SMTP. | |
| OR | |
| 10. A) Explain TCP/IP reference model. | 8 |
| B) Explain different types of local area network (LAN). | 8 |
| 11. A) Explain Gateways with example. Explain leased lines concept. | 8 |
| B) Write short notes on following internetworking devices (any two) : | 8 |
| 1) Bridges | |
| 2) Routers | |
| 3) Hubs. | |
| OR | |
| 12. A) Explain modem and any two types of modem. | 8 |
| B) Explain VPN and VSAT. | 8 |
-



[4063] – 293

**T.E. (Printing) Examination, 2011
COLOUR MANAGEMENT AND STANDARDIZATION
(2008 Course)**

Time : 3 Hours

Max. Marks : 100

- Instructions :**
- 1) Answer to the **two** Sections should be written in **separate** books.
 - 2) **Neat** diagrams must be drawn **wherever** necessary.
 - 3) Black figures to the **right** indicate **full** marks.

SECTION – I

1. Answer **any two** : **18**
 - A) Explain Hue error and Gray error of process inks C, M, Y with their spectral graph,
 - B) Explain the term neutral area and gray balance.
 - C) Explain the colour theories used in Colour reproduction.

2. Solve **any two** : **16**
 - A) Explain the following points for illuminants :
 - 1) Spectral power distribution graph
 - 2) Color Temperature
 - 3) Co-related color temperature
 - 4) Color Rendering Index.
 - B) Explain **any two** :
 - 1) Metameric match and spectral match
 - 2) Human eye pick sensitivities for Red, Green and Blue cones
 - 3) 2° and 10° observer angle.
 - C) Explain the term colour blindness. Explain the following Human vision deficiency - Protanomaly, Deuteranomaly, Protanopia, Deuteranopia.

3. Answer **any four** : **16**
 - A) Basic Attributes of colour
 - B) CIE Lab color system
 - C) Calculate chromaticity co-ordinates for D65 and D50 Illuminants
 - D) Explain one color system based on Colour Mixing
 - E) Human Matching Functions.

P.T.O.



SECTION – II

4. Answer **any two** : **18**
- A) Write down the name of four instrumental geometries used for colour measurement. Explain Integrating Sphere geometry for SCE and SCI measurement.
 - B) Explain the principle and construction of colorimeter. Write down two advantages and two disadvantages of colorimeter.
 - C) Explain the various elements that are used in visual colour measurement.
5. Answer **any two** : **16**
- A) Explain Process profile, Generic Profile and Custom profile.
 - B) Explain Relative and Absolute Colorimetric rendering intent and their application.
 - C) Write down **any two** :
 - 1) Colour Gamut
 - 2) Profile Connection Space (PCS)
 - 3) Test Chart used for Profiling.
6. Solve **any two** : **16**
- A) Write and explain the variables that need to control while standardizing Gravure Printing press.
 - B) Explain the term calibration. Explain Proofer calibration for any substrate with the help of starproof software.
 - C) Write short notes on :
 - 1) Ladder Target
 - 2) Density
 - 3) Dot gain
 - 4) Star Target.
-



[4063] – 295

T.E. (Printing) Examination, 2011
DESIGN OF PRINTING MACHINE COMPONENTS
(2008 Pattern)

Time : 3 Hours

Max. Marks : 100

SECTION – I

1. a) Explain briefly the various phases involved in the process of design of machine elements. 8
- b) Explain in short creativity in design. 8

OR

- a) What are the differences between the properties of brittle and ductile materials ? 8
- b) Explain the types of fit using atleast three examples. 8
2. a) What is the importance of limits, fits in the machine elements ? What are different types of tolerances ? Show how to give such tolerance of machine elements. 8
- b) Two rods are connected by means of a cotter joint. The inside diameter of the socket and outside diameter of the socket collar are 50 and 100 mm respectively. The rods are subjected to a tensile force of 50 kN. The cotter is made of steel 30 C8 ($S_{yt} = 400 \text{ N/mm}^2$) and the factor of safety is 4. The width of the cotter is five times of thickness. Calculate :
- i) Width and thickness of the cotter on the basis of shear failure ; and
- ii) Width and thickness of the cotter on the basis of bending failure. 8

OR

- a) Explain the step by step procedure of design of knuckle joint. 8
- b) Design the ball crank lever. 8

P.T.O.



3. a) Explain ASME code for design of shaft. 8

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 ($S_{yt} = 380 \text{ N/mm}^2$) and the factor of safety is 3. Determine the diameter of the bolts.

Assume that the bolts are finger tight in reamed and ground holes. 10

OR

a) Explain the requirements of couplings and explain how couplings are classified. 6

b) A protected type rigid flange coupling is used to transmit 25 kW power at 500 rpm from an engine to a machine. Design a coupling for an overload capacity of 25 %.

Assume following stresses of coupling. 12

Allowable Stress	C.I. Flange	M.S. (Shaft and key)	Plain Carbon Steel (bolt)
Tensile	20	60	60
Shear	12	35	28
Compressive	60	60	60

SECTION – II

4. a) Prove that maximum efficiency of square threaded screw can be given by

$$\eta_{\max} = \frac{1 - \sin \theta}{1 + \sin \theta} \quad \text{10}$$

b) What are the different types of stresses induced in power screw ? 6

OR



- a) Explain construction and application of recirculating ball screws. **8**
- b) A double threaded power screw with ISO metric trapezoidal threads is used to raise a load of 300 kN. The nominal diameter is 100 mm and the pitch is 12 mm. The coefficient of friction at the screw threads is 0.15. Neglecting collar friction, calculate
- i) torque required to raise the load
 - ii) torque required to lower the load and
 - iii) efficiency of the screw. **8**
5. a) Explain advantages and limitations of welded joint. **8**
- b) Determine the length of weld run for a plate size 120 mm wide and 15 mm thick to be welded to another plate by means of
- i) Single transverse weld
 - ii) Double parallel fillet weld. **8**
- OR
- a) Explain welded symbols. **8**
- b) Explain the basic types of screw fastenings. **8**
6. Write short notes on (**any three**) : **18**
- a) Classification of springs.
 - b) Spring nomenclature.
 - c) Load stress equation for helical spring.
 - d) Stresses induced in helical spring.



[4063] – 297

T.E Printing Examination, 2011
STATISTICAL PROCESS CONTROL
(2008 Pattern)

Time : 3 Hours

Max. Marks : 100

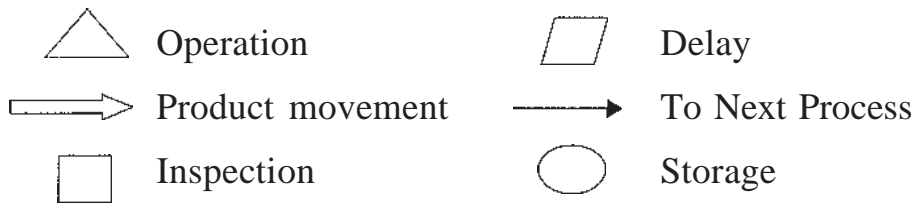
- Instructions :** 1) *All questions are compulsory.*
2) *Assume suitable data, if necessary.*
3) *Answers to the two Sections should be written in separate books.*
4) *Neat diagrams must be drawn wherever necessary.*
5) *Black figures to the right indicate full marks.*

SECTION – 1

1. Explain different tools used in SPC with reference to the printing industry. **16**

OR

1. Prepare the flowchart for the process of 'Make ready Operations on single color offset machine' with the help of following symbols. **16**



2. Explain the various data collection techniques with reference to the Offset printing industry. **16**

OR

2. Explain the probable causes of Bi-Modal and Skewed types of Histograms with reference to the printing activities. **16**

3. Explain the various causes of density variation in Gravure printing process and also suggest the suitable remedy to overcome the same. **18**

OR

3. With example, explain the term 'Mean, Median and Mode' along with their advantages and disadvantages. **18**

P.T.O.



SECTION – 2

4. Explain the importance of variable charts with suitable examples. **16**

OR

4. Explain the importance of attribute charts with suitable examples. **16**

5. Explain various techniques of process improvements with suitable examples. **16**

OR

5. Explain the method of implementing the SPC in an existing printing press with suitable examples. **16**

6. Explain DMAIC with suitable examples from printing industry. **18**

OR

6. Differentiate between, Cp and Cpk Analysis with suitable examples. **18**



[4063] – 3

**T.E. (Civil) (Semester – I) Examination, 2011
STRUCTURAL DESIGN – I (2003 Course)**

Time : 4 Hours

Max. Marks : 100

- Instructions:*
- 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 diagram must be drawn **wherever** necessary.
 - 4) Figure to the **right** indicates **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, IS-875 and steel table is allowed.**

SECTION – I

1. a) Explain in brief advantage and disadvantage of steel as a construction material. 6
- b) The maximum load carrying capacity of a compression member consist of two ISA 100 mm × 100 mm × 8 mm is 250 kN. Determine the length of members. 9
- c) Determine the required weld size to connect a bracket plate to the flange of a column section ISHB 300 @ 63.0 kg/m as shown in Fig. 1 c. 10

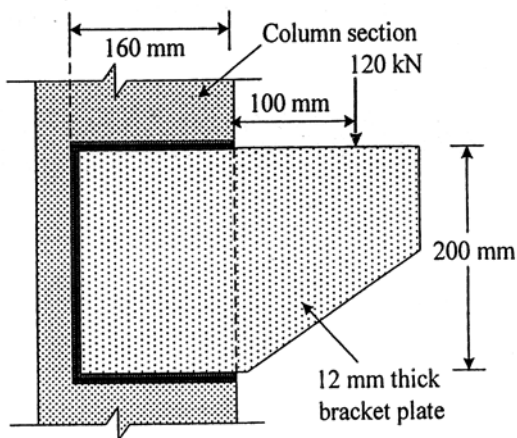


Fig. 1 c

OR

P.T.O.



2. a) State the advantage and disadvantage of welded connection. **6**
- b) Design the main tie of a roof truss subjected to an axial force of 200 kN using angle section if length of the members is 3 m. **9**
- c) An ISLB 325 @ 43.1 kg/m transmit an end reaction of 124 kN to the web of ISHB 300 @ 63 kg/m. Design the bolted connection and draw the design details. **10**
3. a) An ISMB 450 @ 72.4 kg/m is used as a simply supported beam loaded with uniformly distributed load of 25 kN/m. Determine the effective span of the beam, if compression flange is laterally restrained throughout the span. **10**
- b) Design suitable cross section of gantry girder for the following data. Crane capacity is 200 kN, Self weight of crane girder excluding trolley is 200 kN. Self weight of trolley with accessories is 40 kN, Minimum approach of crane hook to gantry girder is 1.2 m, Wheel base is 1.2 m, Span of crane girder is 16 m, Span of gantry girder is 4 m, Self weight of rail section is 300 N/m. **15**

OR

4. a) A simply supported beam of 8 m span subjected to an uniformly distributed load of 50 kN/m, design using suitable I-section if the compression flange is laterally unrestrained throughout the span. **13**
- b) Design an intermediate and horizontal stiffener for welded plate girder of span 24 m and subjected to uniformly distributed load of 100 kN/m excluding its self weight. **12**



SECTION – II

5. a) Calculate the panel point dead load, live load and wind load for the truss of an industrial building shown in Fig. 5 a. The spacing of truss is 4 m and the design wind pressure is 880 N/m^2 . The coefficient of external (c_{pe}) and internal (c_{pi}) wind pressure are 0.6 and ± 0.2 respectively. 15

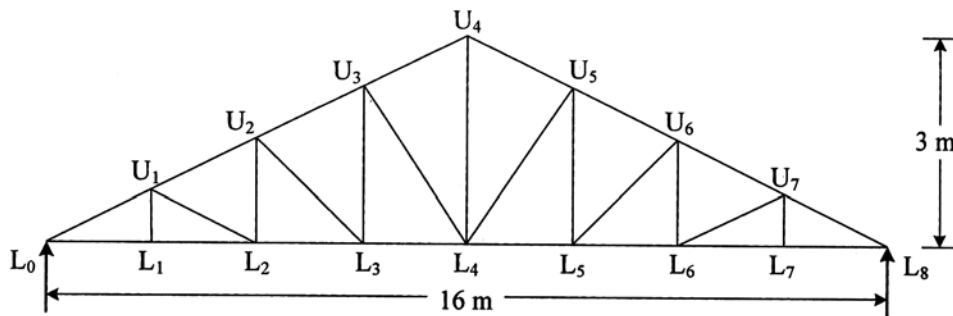


Fig. 5 a

- b) A foot over bridge shown in Fig. 5 b having following details : 10
- 1) Type of girder : N type truss.
 - 2) Span of girders : 20 m
 - 3) Spacing of cross girders : 2.5 m.
 - 4) Clear walking width between main girders : 3 m.
 - 5) Live load : 40 kN/m^2 .

Design timber plank and cross beam for foot over bridge.

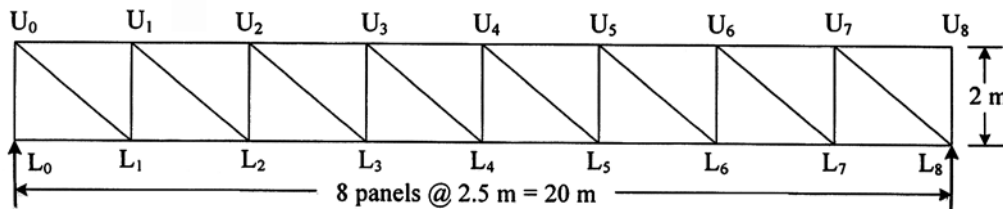


Fig. 5 b

OR



6. a) Determine the magnitude and direction of reaction due to wind load for the truss shown in Fig. 5 a for an Industrial building located in Mumbai. The coefficient of external (c_{pe}) and internal (c_{pi}) wind pressure are 0.6 and ± 0.2 respectively. $k_1 = 1$, $k_2 = 0.88$ and $k_3 = 1$. **10**
- b) Design central top chord and vertical members for the foot over bridge as shown in Fig. 5 b. **15**
7. Two channel sections ISMC 350 @ 42.1 kg/m is used as a built up column having a length of 8 m. One end of column is fixed and other end is hinged. Determine the maximum load carrying capacity of the section. Design suitable lacing system and column base for the same column. Also design the connection for lacing and column base. **25**

OR

8. a) A column of 6 m effective length is carrying an axial load of 400 kN and bending moment of 50 kNm. The bearing pressure from the concrete is assumed to be 4000 kN/m². Design a suitable base and also design the anchor bolts, if required. **18**
- b) Explain in brief the advantage and disadvantage of cold formed light gauge section. **7**



[4063] – 300

T.E. (Printing) Examination, 2011
THEORY OF PRINTING MACHINES AND MACHINE DESIGN
(2008 Pattern)

Time : 4 Hours

Max. Marks : 100

- Instructions :**
- 1) Answer 3 questions from Section – I and 3 questions from Section – II.
 - 2) Answer 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

1. a) Explain the terminology of gear with neat sketched labelled diagram. **8**
- b) Two involute gears in mesh have a module of 6 mm and a pressure angle of 20°. The larger gear has 45 teeth while the pinion has 28 teeth. If they have a standard addendum. Find :
- 1) The contact ratio
 - 2) The angle of action of the pinion and the gear wheel
 - 3) The ratio of sliding to rolling velocity
 - a) At the beginning of contact
 - b) At the pitch point
 - c) At the end of contact. **10**

OR

2. a) Difference between Involute and cycloidal gear. **8**
- b) Explain law of Gearing with diagram. **10**

P.T.O.



3. a) Explain Riverted Gear train. 6
- b) Explain in step the procedure to determine velocity ratio for Epicyclic Gear train. 10

OR

4. In an epicyclic gear train, an arm carries two gears A and B having 36 and 45 teeth respectively. If the arm rotates at 150 r.p.m. in the anti clockwise direction about the centre of the gear A which is fixed, determine the speed of gear B. If the gear A instead of being fixed, makes 300 r.p.m. in the clockwise direction, What will be the speed of gear B ? 16

5. Draw the profile of a cam to raise a valve with S.H.M. through 40 mm in $\frac{1}{4}^{\text{th}}$ of revolution, keep it fully raised through $\frac{1}{10}^{\text{th}}$ revolution and to lower it with uniform acceleration and retardation in $\frac{1}{6}^{\text{th}}$ revolution. The valve remains closed during the rest of revolution. The diameter of the roller is 20 mm and the minimum radius of cam to be 30 mm. The axis of valve rod passes through the axis of cam shaft. The cam shaft rotates at 360 r.p.m. clockwise.

Determine maximum velocity and acceleration of the follower during outstroke and return stroke. 16

OR

6. a) Explain the types of follower motion. 8
- b) Explain types of cam according to shape. 8



SECTION – II

7. a) Explain in short :

1) Fatigue failure

2) Fluctuating stress

3) Stress concentration.

10

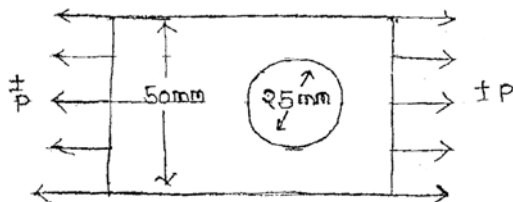
b) Explain endurance limit modifying factors.

8

OR

8. A plate made of plain carbon steel 20CB ($s_{ut} = 440 \text{ N/mm}^2$) is shown in fig. The theoretical stress concentration factor and notch sensitivity are 2.50 and 0.80 respectively. The surface finish factor, size factor and reliability factor are 0.67, 0.85 and 0.897 respectively. The plate thickness is 30 mm. If the required factor of safety is 2.0, determine the maximum completely reversal axial force the plate can taken for infinite life.

18



9. a) Explain causes and Remedius for following gear tooth failure

a) Corrosive wear

b) Bending failure

c) Abrasive wear

d) Initial pitting.

12

b) Explain factors considered while selecting the type of gear drive.

6

OR



10. Two gear wheels mesh externally and are to give a velocity ratio of 3 to 1. The teeth are of involute form ; Module = 6 mm, addendum = one module, pressure angle = 20° . The pinion rotates at 90 r.p.m. Determine :
- 1) The number of teeth on the pinion to avoid interference on it and the corresponding number of teeth on the wheel
 - 2) The length of path and arc of contact
 - 3) The number of pairs of teeth in contact and
 - 4) The maximum velocity of sliding. **18**
11. a) Enumerate the steps for selecting the bearing from manufacturers catalogue. **12**
- b) Difference between sliding contact and roller contact. **4**
- OR
12. a) Explain static load carrying capacity and dynamic load carrying capacity. **8**
- b) A cylindrical roller bearing is subjected a radial load of 5000 N. The desired life of the bearing with 90 percent reliability is 15,000 hrs. The application factor is 1.5. If the shaft rotates at 1440 rpm. Calculate the required basic dynamic load rating of the bearing. **8**



[4063] – 301

T.E. Chemical (Semester – I) Examination, 2011
CHEMICAL ENGINEERING MATHEMATICS
(2008 Pattern)

Time : 3 Hours

Max. Marks : 100

- Instructions:** 1) Answers to the **two** Sections should be written in **separate** books.
2) **Neat** diagrams must be drawn **wherever** necessary.
3) **Black** 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

1. a) Calculate specific volume of pure gas at given temperature by using Bridgemans

equation of state $PV = RT + \frac{\beta}{V} + \frac{\gamma}{V^2} + \frac{\delta}{V^3}$ by Newton Raphson method.

$$\beta = RTB_0 - A_0 - \frac{RC}{T^2}$$

$$\gamma = RTB_0b + \alpha A_0 - \frac{RB_0C}{T^2}$$

$$\delta = \frac{RB_0bC}{T^2}$$

Data : Pure gas = n-butane at 425°K and pressure of 4 atm.

$$A_0 = 17.794 \quad B_0 = 0.2462$$

$$\alpha = 0.12161 \quad b = 0.09423$$

$$C = 350 \times 10^4 \quad R = 0.0826 \text{ (L. atm)/mol K}$$

The units for each variables are p = atm, V = lit/mol, T = Kelvin.

10

- b) Discuss different types of errors associated with numerical methods.

8

OR

P.T.O.



2. a) Use secant method to find the root of the equation $\cos x - xe^x = 0$. Use initial guess $x_1 = 0$ and $x_2 = 1$ to obtain accuracy of 0.01. **10**

b) State and explain graphical interpretation of False position method. **8**

3. a) Develop the Gauss Seidal iterative scheme for the solution of the system

$$10x_1 - 5x_2 - 2x_3 = 3$$

$$-4x_1 + 10x_2 - 3x_3 = 3$$

$$-x_1 - 6x_2 + 10x_3 = 3$$

Iterate upto an accuracy of 0.0001 starting with initial guess $x_0 = 0$. **10**

b) State the categories to solve linear algebraic equations and discuss direct and iterative method in brief. **6**

OR

4. a) Discuss in short the drawbacks of Elimination methods. **8**

b) Use Gauss Jordan method to solve the following equation

$$2x_1 + 3x_2 - 4x_3 = 1$$

$$5x_1 + 9x_2 + 3x_3 = 17$$

$$-8x_1 - 2x_2 + x_3 = -9$$
 8

5. a) It has been observed that the rate of flow of water through a five engine hose is a quadratic in pressure P, at the nozzle end. The observed data is

Q	9.4	11.8	14.7	18.0	23.0
P	1.0	1.6	2.5	4.0	6.0

Fit a parabola in the form $Q = ap^2 + bp + c$ by least square method. **8**

b) Explain quantification of error of linear regression. **8**

OR



6. a) The velocity distribution of a fluid near a flat surface is given by

x	0.1	0.3	0.6	0.8
V	0.72	1.81	2.73	3.47

x is the distance from the surface (mm) and V is velocity (mm/sec)

Use Lagranges interpolation polynomial to obtain the velocity at x = 0.4.

8

b) Find the interpolating polynomial for the data

x	0	1	2	5
y = f(x)	2	3	12	147

Find the value of y at x = 1.5.

8

SECTION – II

7. The temperature of the slab at one end is 1000°C. The ambient temperature is 45°C. Heat flow from one end to other end of the slab is 20.4 KW, for area of 1m². The thermal conductivity of a slab is given by $K = 0.8 (1 + 0.02T)$ where T is the temperature at the other end. If the thickness of the slab is 40 cm. Find the temperature at the other end using Eulers method, take h = 0.01m.

16

OR

8. a) Use the Runge-Kutta 4th order method to find the value of y when x = 1 given that

$$y = 1 \text{ when } x = 0 \text{ and } \frac{dy}{dx} = \frac{y-x}{y+x}.$$

8

b) Discuss the stability region of Runge-Kutta method.

8

9. Solve $\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2}$ for the following condition using Crank-Nicolson method. At x = 0 and x = 3, u = 0 for all values of t

$$\text{At } t = 0, u = x^2 \text{ for } 0 < x < 3$$

Take increment in x as 1 and increment in t as 0.1. Find all values of u for t = 0 to t = 0.3.

16

OR



10. Using the finite difference method solve the boundary value problem

$$x^2 \frac{d^2y}{dx^2} + x \frac{dy}{dx} = 1 \text{ with } y(1) = 0$$

$y(1.4) = 0.0566$. Find $y(1.1)$, $y(1.2)$, $y(1.3)$.

16

11. A chemical is produced by a batch process. Chemicals X and Y are used to make Z with the following relationship for Kg of Z produced and Kgs of X and Y used

$Z = 1.5 (1.1x + 1.3 YZ - XY)^{0.5}$ X costs Rs. 0.18/Kg; Y Rs. 0.08/Kg and Z sells for Rs. 1.60/Kg. One half of the selling price for Z is due to costs other than raw material. Only Z is recovered from the process. Find the maximum profit obtainable per Kg of Z.

18

OR

12. a) Explain scanning and bracketing procedures for optimization of unconstrained functions of one dimensional search.

9

b) What is optimal solution and what are the six steps of optimization ?

9



[4063] – 31

**T.E. (Production Engineering) (Semester – I) Examination, 2011
MATERIAL SCIENCE AND COMPOSITE MATERIALS
(2003 Course)**

Time : 3 Hours

Max. Marks : 100

- Instructions:** 1) Answer **any three** questions from **each** Section.
2) Answers to the **two** Section should be written in **separate** answer book.
3) Neat diagrams must be drawn **wherever** necessary.
4) Black figures to the **right** indicate **full** marks.

SECTION – I

1. a) Draw neat Fe-Fe₃C equilibrium diagram with all important phases and temperatures. 8
b) Describe the steps used for specimen preparation during the metallographic study. 8
OR
2. a) Explain in detail working of metallurgical microscope with ray diagram. 8
b) Explain with sketch, how mechanical properties of plain carbon steel vary with % C. 8
3. a) Differentiate between : 10
i) Annealing and Normalising
ii) Hardening and Tempering.
b) What is hardenability ? Explain Jominy hardenability test. 8
OR
4. a) List out effects due to heat treatment and suggest remedial measures for main defects. 6
b) Describe the important objectives for the heat treatments of steel. 6
c) What is retained austenite ? Why it is not desirable ? 6

P.T.O.



5. a) Differentiate between : 16
i) Nitriding and carburizing
ii) Flame hardening and induction hardening.

OR

6. a) Explain isothermal heat treatments such as austempering and martempering. 8
b) Explain carbonitriding and carburizing in details. 8

SECTION – II

7. a) Draw microstructures of different cast irons. List out applications of each cast iron. 10
b) What are the types of stainless steels ? Explain their properties and applications. 8

OR

8. a) What are the advantages of alloy steels over plain carbon steels. List out the applications of these steels. 10
b) Describe various heat treatments for cast irons. 8

9. Give typical composition, properties and applications of the following : 16
i) Babbitt ii) Cartridge Brass
iii) Invar iv) Gun metal.

OR

10. a) What are the basic requirements of bearing materials ? Name some important materials that are used for bearings. 8
b) Draw microstructure of alpha brass and alpha-beta brass. Suggest their applications. 8

11. a) What is composite ? Describe various types of composites with their typical applications. 8
b) Write short note on : 8

- i) Nanomaterials and their applications
ii) Biomaterials.

OR

12. a) What are the unique properties composites have over the conventional materials ? 8
b) How glass and carbon fibres are produced ? Explain the effect of fiber length on tensile strength of composite. 8



[4063] – 313

T.E. (Petroleum) (Semester – I) Examination, 2011
DRILLING OPERATIONS
(2008 Pattern)

Time : 3 Hours

Max. Marks : 100

- Instructions :**
- 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) Black 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

1. a) What are the basic design features of a rotary roller bits ? Explain tooth wear grading system of these bits ? **6**
- b) A double acting duplex pump with 2.5 rod and 20" stroke is to be operated at 60 SPM for drilling 10,000 ft. The maximum available pump hydraulic horse power is 1360 hp. The pump delivery pressure recommended for optimum hydraulics is 3423 Psi. Determine liner size efficiency = 90%. **6**
- c) Describe basic differences between annular preventer and ram preventers. **4**
- d) Find pressure gradient if mud density = 9 ppg and 12 ppg. **2**

OR

P.T.O.



2. a) Pipe is differentially stuck at 11,400 ft, formation pressure = 5840 psi, 9-5/8" casing = 10,600 ft, Drill pipe O.D. = 5", ID = 4.276", mud density = 13 ppg.
- It is required to reduce hydrostatic pressure in the drill pipe and the annulus so that both are equal to formation pressure calculate volume of water required in both annulus and drill pipe. Density of salt water = 9 ppg, annular capacity between drill pipe and casing = 0.0515 bbl/ft Capacity of drill pipe = 0.0178 bbl/ft explain pumping procedure. **9**
- b) With the help of neat and labelled figure draw mud circulation system. **9**
3. a) Describe basic components of a drill string used to drill the well. **6**
- b) A 260, 000 lb drill string is being used in a well company policy states that the rig will have sufficient horse power to raise the string at a minimum rate of 93 ft/min. Calculate horse power. **2**
- c) Discuss advantages and disadvantages of Top drive system. **8**

OR

4. a) Describe basic differences between Casing pipe, Drill pipe and drill collar of same O.D. **4**
- b) What a minimum draw-works horse-power is required in order to drill 10,000 ft of 16.6 ppf drill pipe with an O.D. of 4.5" and 50,000 lbs of drill collar. Minimum hoisting speed is recommended as 100 ft/min hoisting efficiency = 0.65. **6**



- c) Describe
- i) Fleet angle
 - ii) Journal angle
 - iii) Bitis protector. **6**
5. a) When to quit the fishing job if value of fish is 100,000 Rs., cost of side track = 100,000 Rs. fishing daily cost = 5,000 Rs., Rig daily cost = 15,000 Rs. **2**
- b) Describe any two fishing tools to recover non-tubular objects from the bore hole. **8**
- c) Discuss different types of directional wells with required B.H.A. using illustrative sketch. **6**

OR

6. Explain :
- a) UTM co-ordinate system in directional drilling. **6**
 - b) Convert polar co-ordinate to rectangular if 160° azimuth and radius 250 M. **2**
 - c) Discuss different types of horizontal wells. **4**
 - d) Define :
 - i) KOP
 - ii) Azimuth
 - iii) Inclination
 - iv) Measured depth. **4**



SECTION – II

7. Calculate number of class G cement sacks for lead slurry and Tail slurry **18**

13 - 3/8" casing cementation job

Well depth = 915 m, shoe depth = 910 m

Float collar length = 886 m, Cement top = 77 m

Previous shoe depth 309 m,

Excess cement : 50 % on lead slurry and 30 % on tail slurry, Static Bottom hole temp = 122°F

Hole diameter 19.124 inch, from 0 m to 309 m

17.5" hole diameter from 309 m to 910 m

Casing 13 - 3/8" ID = 12.515, weight 61 ppf

Length = 910 (m), Mud weight = 8.70 ppg

Preflush or spacer density = 10 ppg, Volume = 40 bbl

Top of spacer = 10 m, Height = 67 m

Lead slurry density = 12.7 ppg

Cement yield = 2.0630 ft³/sack

Length of lead slurry is from bottom 760 m to top 77 m

Tail slurry density = 15.80 ppg

Cement yield = 1.1670 ft³/sack

Height of Tail slurry is upto 760 M

Also calculate

1) Displacement volume

2) Differential pressure at shoe [consider after flush volume 10 bbl].

OR



8. a) Discuss purpose and casing properties in detail. **6**
- b) Calculate slurry weight and water requirement. If slurry contains Class H Cement, 18 % salt and 46 % water, absolute volume of salt = 0.0412 Class H Cement weight = 94 lb/sack absolute volume of Class H Cement = 3.60 gal/sack water weight = 8.33 ppg Basis 1 sack of Class H Cement. **4**
- c) Discuss purpose and types of squeeze cementation with suitable sketch. **8**
9. a) It is desired to increase a mud weight from 12 ppg to 0.78 psi/ft using barite having SP gravity 4.25. Determine the cost owing to mud weight increase. Assume barite cost \$ 101 / 100 lbs. Initial volume of mud 60 m³. **6**
- b) A well is being planned that will use 15.0 ppg mud. The hole and surface pit volume will be 850 and 350 bbl respectively. How many sacks of barite should be maintained on the drilling location ? (Assume that one sack contain 100 lb of barite). **4**
- c) Discuss the use of oil base mud in detail. **6**

OR

10. a) What is ECD ? Discuss Importance of ECD during drilling operations. **6**
- b) Discuss different functions of drilling fluid. **4**
- c) Calculate hydrostatic pressure for
- i) 10,000 ft of 12.0 ppg mud.
 - ii) 10,000 ft of 1.2 gm/cc mud. **2**
- d) Discuss mud rheological properties in brief. **4**



11. a) Depth = 2350 m Hole size = 12.25" 8
- Mud weight = 10.8 ppg Pump pressure = 2220 psi
- Plastic viscosity = 18 CP Flow rate = 600 gpm
- Yield point = 22 lb/100 ft², Nozzle size = 16, 16, 16
- Total system pressure loss = 1188 psi
- Annular pressure loss = 43.3 psi
- Drill pipe OD = 5"
- Calculate :
- i) TFA (Total flow area)
 - ii) Bit Nozzle pressure drop
 - iii) ECD
 - iv) B.H.H.P.
 - v) Nozzle velocity
 - vi) BHHP/Sq. inch hole size
 - vii) Jet impact force
 - viii) Jet impact force / Hole area.
- b) What is optimum hydraulics ? 2
- c) Following are Fann Viscometer readings
- $\theta_{300} = 35$ $\theta_{600} = 64$
- Calculate PV, YP, n and k. 4
- d) Discuss different types of fluid. 2

OR



12. Using power law model, determine pressure drop in drill pipe and drill collar
find out flow behaviour inside drill pipe and drill collar

Data given as :

Plastic viscosity = 12 CP, Mud weight = 8.8 ppg,

Yield point = 12 lb/100 ft², Drill pipe. ID = 4.276 inch

OD = 5", Length = 6480 ft,

Drill collar ID = 2.875 inch OD = 8 inch

Length = 620 ft

Stand pipe pressure = 2200 psi

Hole size = 12.25"

Flow rate = 700 GPM.

16



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T.E. (Petroleum Engineering) (Semester – II) Examination, 2011
PETROLEUM GEOLOGY – II
(2008 Course)

Time : 3 Hours

Max. Marks : 100

Instructions : 1) Answers to the questions of **both** the Sections should be written in **separate** answer books.
2) Draw neat diagrams **wherever** necessary.

SECTION – I

1. A) Explain the terms: sour gas, sweet crude, gas hydrate, porphyrins, and geochemical fossils. 15

OR

2. A) With the help of neat diagrams give important types of subsurface occurrences of petroleum. 5

- B) What is the importance of study of oilfield produced water ? Explain one chemical and one genetic classification of oil field water. 10

3. A) Under what conditions organic matter is accumulated in a sedimentary basin ? 8

- B) Explain the properties that a rock should possess to qualify as a reservoir rock. 7

OR

4. Give geochemical aspects of transformation of organic matter to hydrocarbons in nature with the help of neat diagrams. 15

5. Answer **any two** of the following : 20

A) Types of Kerogen

B) Structural traps

C) Mechanisms of primary and secondary migration

D) Non conventional hydrocarbon resources.

P.T.O.



SECTION – II

6. A) Explain in brief important marine depositional environments with sketches. **15**
OR
7. Write notes on **any three** of the following : **15**
A) Diagenesis and effects on porosity.
B) Types of carbonate porosity.
C) Maturation of hydrocarbons in reservoir rocks.
D) Significance of transgressive and regressive cycles in relation to petroleum occurrence.
E) Sulphur component in oil and gas.
8. Describe reservoir, source rock and hydrocarbon potential of **any one** basin from below :
a) Krishna – Godavari basin
OR
b) Mumbai Offshore
OR
c) Cambay basin of India. **15**
9. Answer **any two** of the following : **20**
A) Geological Heterogeneities.
B) Describe in brief the procedure to carry out analysis of drill cuttings.
C) Explain different types of subsurface maps. How are they prepared ? How are they useful in understanding geology of the area ? To what extent computer software is useful in preparing subsurface maps ?
D) Klemmes classification of sedimentary basins.
-



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T.E. (Petroleum Engineering) (Semester – II) Examination, 2011
RESERVOIR ENGINEERING – I
(2008 Pattern)

Time : 3 Hours

Max. Marks : 100

- Instructions :** 1) Answers to the **two** Sections must be written in **separate** answer books.
- 2) Question No. **1 (one)** and No. **7 (seven)** 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

1. a) A core in the shape of a “V” is made of two pieces of 10 cm each, first part is inclined to the horizontal at 30 degrees. 10 cm from the inlet, the second piece is inclined to the horizontal at 60 degrees. Flow is from bottom to top. Find the flow rate in cc/sec if permeability is 1 darcy in the first section and 2 darcy in the next section, cross section area of the entire core is 6 ft squared viscosity is 1 cp, inlet pressure is 15 atm, outlet pressure is 2 atm, SG of fluid is 1.07. **8**
- b) Explain the Helium Porosimeter. **2**
- c) Explain one method to find Pc curve. **6**
- d) Derive Laplace’s Equation for wettability. **2**
2. Explain Px and Tx diagrams. What is the use of these graphs in Petroleum Engineering ? **16**

P.T.O.



3. a) Mention two main assumptions in Darcy's law. **1**
- b) What is flash and differential Liberation Process ? **3**
- c) Derive the equation for radial laminar flow of gas in porous media. **8**
- d) 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 127 ft. Gas viscosity is 0.012 cp, $z = 0.9$. If the well is flowing at 3150 psia and $r_w = 0.4$ ft, calculate
- i) Flow rate, **4**
- ii) BHP if rate is increased to 9.5 MMSCF/D. **4**
4. a) Derive an expression for radial turbulent flow of a gas in porous media. **12**
- b) Find the gas flow rate when a consolidated sand core 3 cm in diameter and 6 cm long has a permeability of 225 md and a porosity of 20%. Air at 75 F is injected into his core. The inlet pressure is 100 psia and the outlet pressure is 14.7 psia. The viscosity of air is 0.02 cp and the compressibility is assumed to be 1.0. Beta is 0.97 atm-sec²/g. **4**

SECTION – II

5. For the given reservoir operating under a combination drive mechanism of water, gas cap expansion and depletion drive, find the dominant drive mechanism for this reservoir. Will the same drive mechanism always be dominant ? Why ? **16**
- Initial reservoir pressure 2810 psia
- Initial FVF = 1.30 bbl/STB
- Initial two phase FVF = 7.5241 cu ft/STB
- Initial gas formation volume factor = 0.006266 cu ft/SCF
- Initial dissolved GOR = 580 SCF/STB
- Current reservoir pressure = 2000 psia
- Oil produced during the interval = 25 MMSTB
- Average produced GOR = 700 SCF/STB
- Two-phase FVF at 2000 psia = 8.3967 cu ft/STB
- Volume of water encroached = 65.02 MM cu ft
- Volume of water produced = 6.06 MM res cu ft
- FVF of water = 1.028 bbl/STB
- Gas volume factor at 2000 psia = 0.008489 cu ft/SCF.



- 6. a) Write a short note on recovery factors. 4
- b) Given an undersaturated reservoir with properties shown in figure 1, find initial oil in place. At 2800 psia, find the recovery factor. If one quarter of the produced gas has been returned to the reservoir, at 2800 psia, find the recovery factor. Cumulative GOR at 2800 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. 12

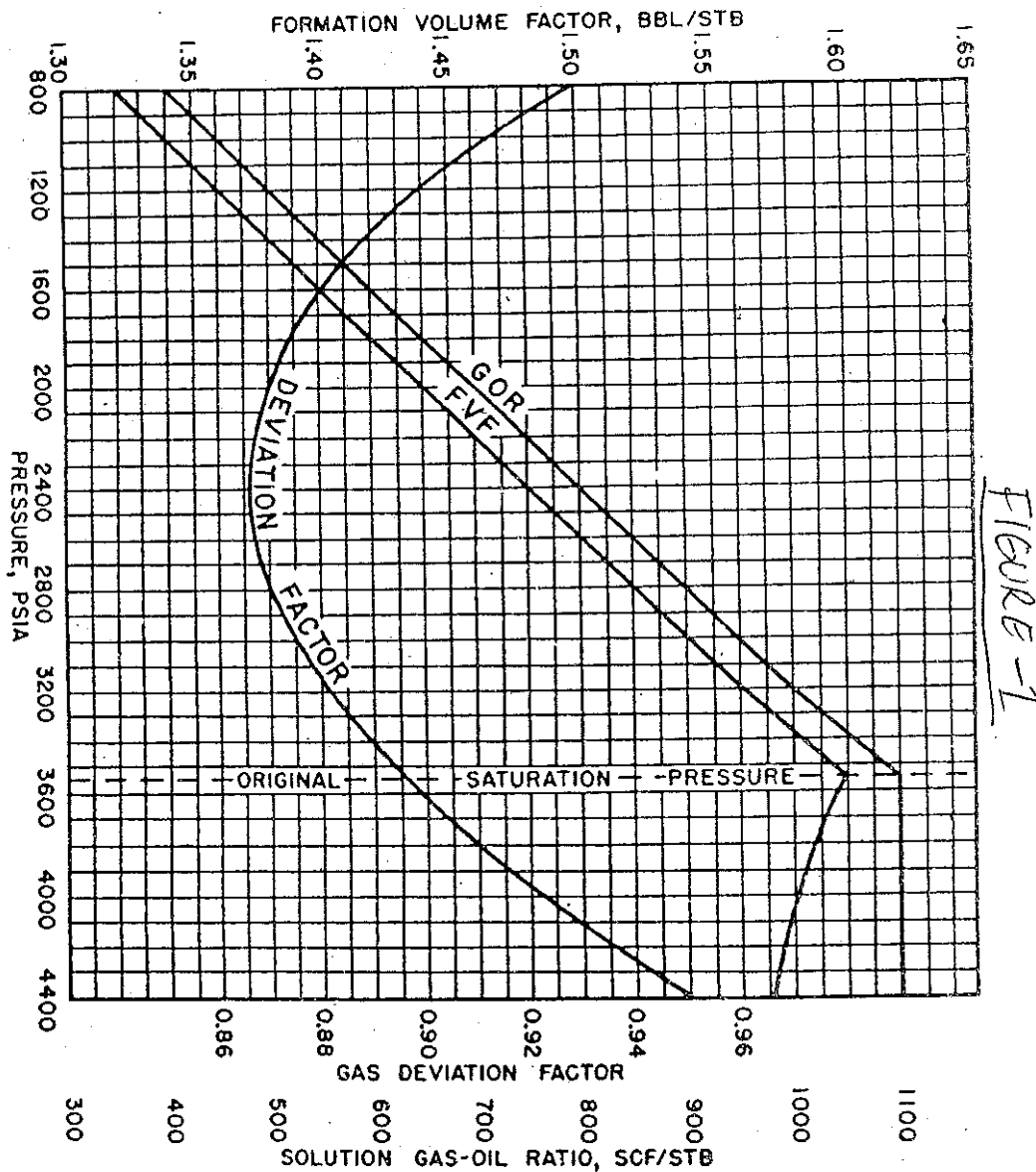


FIGURE -1



7. a) Derive the generalized material balance equation for combination drive mechanism.
What is the interpretation of $F = [] E_g$? **12**
- b) For the data in question five (5), calculate N. **6**
8. Write short notes on : **16**
- i) Derive gas in place by MBE equation.
 - ii) Derive the material balance equation only for rock and fluid expansion drive mechanism only, starting from basics, not from the generalized MBE.
 - iii) Drive indices.
 - iv) Role of a reservoir engineer.



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**T.E. (Production/Prod. S/W) Examination, 2011
(2003 Course)**

KINEMATICS AND DESIGN OF MANUFACTURING MACHINES

Time : 4 Hours

Max. Marks : 100

- Instructions :** 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) **Black** 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 – 1

1. a) Explain Kinematic structure of Gear Hobbing Machine with neat sketch. **8**
- b) What do you understand by the synthesis of mechanism ? Explain
- a) Type synthesis
- b) Number synthesis
- c) Dimensional synthesis. **8**

OR

2. a) Design a slider crank mechanism to co-ordinate three position of the input and output links as follows :
- $\theta_1 = 20^\circ$, $\theta_2 = 35^\circ$, $\theta_3 = 50^\circ$
 $S_1 = 80$ mm, $S_2 = 60$ mm, $S_3 = 30$ mm

To find a,b,e.

10

P.T.O.



b) Explain the following Kinematic representation with figures.

- i) E-21
- ii) C-12
- iii) K-23

UNIT – 2

3. a) What is cumulative fatigue damage ? How the life of component subjected to different values of fluctuating stresses in cycle, is estimated by using Miner's Equation ? **6**

b) A cantilever beam of circular cross section, made of steel ($S_{ut}=630\text{N/mm}^2$); is fixed at one end and subjected to a completely reverse force of 700 N at the free end. The force is perpendicular to the axis of the beam. The distance between the fixed and free end of the cantilever beam is 400 mm. If desired life of the beam is 40000 cycles, determine the diameter of the beam.

Assume following data:

- Theoretical stress concentration factor = 1.33
- Notch sensitivity = 0.85
- Surface finish factor = 0.79
- Size factor = 0.85
- Temperature factor = 0.975
- Reliability factor = 0.868
- Factor of safety = 1.2 **10**

OR

4. a) Define the following terms in short : **6**

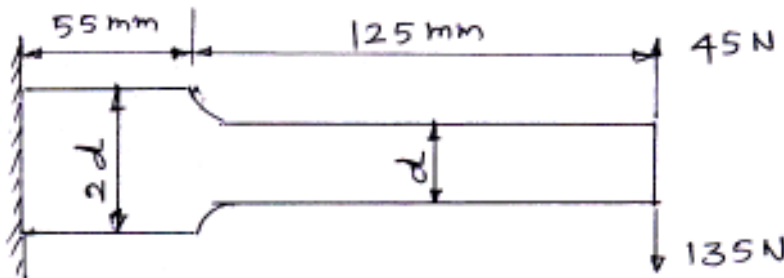
- i) Endurance limit
- ii) Notch Sensitivity
- iii) Fatigue



b) A steel cantilever beam shown in figure is subjected to a transverse loading at its end that varies from 45 N up to 135 N down. Determine the required diameter at the change of cross section for infinite life using a factor of safety 2.

Assume following data :

- Yield strength = 470 N/mm²
- Ultimate tensile strength = 550 N/mm²
- Theoretical stress concentration factor = 1.63
- Notch sensitivity = 0.8
- Load factor = 0.923
- Surface finish factor = 0.9
- Size factor = 0.85



10

UNIT – 3

5. a) A spur pinion having 20 teeth is to mesh with a gear having 43 teeth. The pinion and gear are to be made of plain carbon steels having ultimate strengths of 600N/mm² and 400N/mm² respectively. The pinion is to be driven by an electric motor having a speed of 1440 rpm and 5 kW rating. The starting torque of the motor is twice the working torque. If the surface hardness of the gear pair is to be 400 BHN. The face width is 10 times the normal module and tooth system is 20° full depth involute. The gears are to be machined to meet the specifications of grade 7. Design a gear pair with a factor of safety 1.5.



Calculate :

- 1) Beam Strength
- 2) Wear Strength
- 3) Module
- 4) Dynamic Load by Spott's equation

Use following data :

$$\text{For Grade 7} \rightarrow e = 11.0 + 0.9[m + 0.25\sqrt{d}]$$

$$F_d = \frac{e \cdot n_p \cdot Z_p \cdot b \cdot r_p \cdot r_g}{2527 \sqrt{r_p^2 + r_g^2}} \cos \phi$$

$$\text{and } Y = 0.487 - \frac{2.87}{Z}; K_v = \frac{6}{6 + V}$$

12

- b) What do you mean by formative number of teeth in helical gear ? Derive the relationship.

6

OR

6. a) The following data is given for a helical gear pair made up of steel, transmitting 15 kW power from a shaft rotating at 1440 rpm to another parallel shaft rotating at 360 rpm.

- Centre distance = 245 mm
- Helix angle = 24°
- Face width = 10 m_n
- Number of teeth on pinion = 18
- Permissible bending stress for pinion material = 152 N/mm²
- Permissible bending stress for gear material = 125 N/mm²



- Tooth system =20° full depth involute
- Service factor =1.4
- Grade of machining =8

Calculate :

- i) Module
- ii) Bending strength
- iii) Dynamic Load by Spott's equation
- iv) The factor of safety against bending failure
- v) The surface hardness, if the factor of safety against pitting failure is 1.5

Use following data :

$$\text{For Grade 8} \rightarrow e = 116.0 + 1.25[m_n + 0.25\sqrt{d}]$$

$$F_d = \frac{e \cdot n_p \cdot Z_p \cdot b \cdot r_p \cdot r_g}{2527 \sqrt{r_p^2 + r_g^2}} \cos \phi \cos \phi$$

$$Y' = 0.487 - \frac{2.87}{Z'}. \quad \mathbf{12}$$

- b) Derive an expression for beam strength of spur gear. **6**

SECTION – II

UNIT – 4

7. a) Explain the following properties of sliding contact bearing material.

- i) Conformability
- ii) Embedability
- iii) Bondability
- iv) Fatigue Strength.

8



- b) A ball bearing operates on a work cycle consisting of three parts: a radial load of 3000 N at 700 rpm for 30% of cycle, a radial load of 6000 N at 1400 rpm for 40% of cycle and a radial load of 5000 N at 1000 rpm for the remaining part of cycle.

The basic dynamic capacity of the bearing is 30700 N

Calculate :

- i) The rating life of the bearing in hours
- ii) The average speed of rotation
- iii) The life of bearing with 95% reliability. **10**

OR

8. a) Enumerate the steps for selecting the bearings from manufacturer's catalogue. **6**
- b) Describe various steps in design of journal bearings. **6**
- c) What are the additives ? Explain the different types of additives used in lubricating oil. **6**

UNIT – 5

9. a) A punching press executes 20 holes of 20 mm diameter per minute in a plate of 15 mm thickness. This causes the variation of speed in the press flywheel from 250 rpm to 225 rpm. The punching operation takes 1.5 sec/hole. Assume 5 Nm of work to be done to shear 1 mm² of the area and that the frictional losses accounts for 15% of the work supplied for punching.

Determine :

- i) Power needed to operate the press
 - ii) Mass of the flywheel if its mean rim radius is 0.5 m
 - iii) Cross sectional area of the rim if $\rho = 720\text{kg/m}^3$. **10**
- b) With the help of suitable examples, explain the importance of aesthetic considerations in the product design. **6**

OR

10. a) Explain why flywheels are used in punching machines. Does the mounting of a Flywheel reduce the stress induced in the shafts ? **4**
- b) What is concurrent engineering ? What is its significance in the product design ? **6**
- c) What is Design for assembly ? Explain the general principles to be followed while designing the parts for assembly. **6**



UNIT – 6

- 11. a) Draw neat sketch of normal curve and write its equation in terms of standard variables. 8
- b) Explain with suitable example the method of optimum design for normal specifications. 8

OR

- 12. a) What is adequate design and optimum design ? Explain with suitable examples. 6
- b) The recommended class of fit for the journal and the bearing of a hydrodynamic bearing is $20 H_7-e_8$. The diameters of the journal and bearing are normally distributed . From the consideration of hydrodynamic action and bearing stability , the maximum and minimum clearances are limited to 0.08 and 0.05 mm respectively. Determine the percentage of rejected assemblies. The tolerances in micron are as follows. 10

Diameter, mm	H_7		e_8	
	e_s	e_i	e_s	e_i
20	+21	0	-40	-73

Z	1.8	1.9	2.0	2.1	2.2	2.3	2.4	2.5
Area	0.4641	0.4713	0.4772	0.4821	0.4861	0.4893	0.4918	0.4938

Z	2.6	2.7	2.8
Area	0.4953	0.4965	0.4974

Use linear interpolation for values in between.



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**T.E. (Production) (Semester – I) Examination, 2011
MATERIAL FORMING (Common with S/W)
(2003 Course)**

Time: 3 Hours

Max. Marks: 100

- Instructions:**
- 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) **Black** 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

1. a) Explain and sketch stress-strain diagrams for the material exhibiting 8
 - i) Elastic behaviour
 - ii) Plastic behaviour
 - iii) Rigid behaviour
 - iv) Elastic-plastic behaviour.
- b) What are the assumptions in material forming ? What are the different methods used for the analysis of forming processes. 8

OR

2. a) Explain briefly the theories of plastic yielding. 8
- b) Explain the effect of temperature, strain rate and friction on metal forming process. 8

Unit – II

3. a) Explain and suggests the equipment required to manufacture the following components. 10
 - i) Headed bolt
 - ii) Connecting rod.
- b) Explain the forging of gear blank and coupling hook considering grain flow structure. 8

OR

P.T.O.



4. Explain the following : 18
- i) Isothermal forging and its advantages
 - ii) Metallurgy of forging
 - iii) Upsetting.

Unit – III

5. Derive an equation for the drawing stress in tube drawing operation using fixed tapered plug. 16

OR

6. a) Show that the maximum permissible reduction in strip drawing using tapered dies is 60%.
Assume coeff. of friction, $\mu = 0.05$ and semi die angle $\alpha = 15^\circ$. 8
- b) Explain set up of wire drawing and rod drawing with neat sketch. 8

SECTION – II

Unit – IV

7. A steel strip of size thickness 100 mm \times width 140 mm \times length 1000 mm is rolled in rolls of diameter 600 mm with reduction of 20% the coefficient of friction is 0.35 the roll rotate at speed 160 rpm determine. 16
- i) Arc contact length
 - ii) Angle of bite
 - iii) Ratio neutral section thickness of final thickness
(Assume rear tension coefficient = 0.892 and front tension coefficient = 1)
 - iv) Neutral angle
 - v) Forward slip.

OR

8. Explain various types of rolling mills used for the rolling operations. 16



Unit – V

9. a) An Aluminum billet 25 mm diameter and 1m long is extruded to the square cross section square. The flow stress of aluminum is 60 N/mm^2 . The coefficient of friction between billet and container is 0.2. Calculate :
- i) Extraction ratio
 - ii) CCD
 - iii) Shape factor
 - iv) Work done during extrusion
- 16**

OR

10. a) Sketch the plant layout generally for forward extrusion process and also state the accessories required. **8**
- b) Explain various lubrication processes required in hot extrusion and cold extrusion process state the lubricant used. **8**

Unit – VI

11. a) Explain the important process variable which affects the deformation of the metal in electro-hydraulic forming. **10**
- b) Explain the various types of spinning process with neat sketch. **8**

OR

12. a) Explain the importance of field shaper and drivers in electro-magnetic forming. **5**
- b) Distinguish between HERF and HVF. **5**
- c) Explain the types of explosive forming process with neat sketch. **8**



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**T.E. (Production) (Semester – I) Examination, 2011
(2003 Course)**

PRODUCTION PLANNING AND CONTROL

Time: 3 Hours

Max. Marks: 100

*Instructions : 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) **Black figures** to the **right** indicate **full** marks.*

*5) Your answer 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

Unit – I

1. a) Define production planning. Explain the levels of production planning and factors which determine the production planning. **9**
- b) Explain with the help of Block diagram functions of PPC. **9**

OR

2. a) Explain an integrated approach towards PPC function. **9**
- b) Explain different production systems used in industries. **9**

P.T.O.



Unit – II

3. a) Explain different factors which affect sales forecasting. 7
- b) There is a correlation between the population of the city and Maruti Swift diesel model sold. This relation is shown in the following table. 9

Population in lakh	15	19	21	24	28	31
Number of Maruti Swift (Diesel) sold (X1000)	39	51	76	92	117	138

Estimate the sales of Maruti Swift Diesel for the cities with population 40 and 55 lakh.

OR

4. a) Explain the difference between forecasting and prediction and explain the necessity of demand forecasting in the organization. 8
- b) Following table gives the demand for 10 months. The forecast for the first month was 92 units.
- i) If the smoothening factor 0.3 is used forecast the demand for 11th month. 4
- ii) Calculate MFE (Mean Forecast Error). 2
- iii) Calculate MAD (Mean Absolute Deviation) 2

Months	1	2	3	4	5	6	7	8	9	10
Demand	92	97	98	92	93	99	89	94	96	99

Unit – III

5. a) Draw a route sheet/process sheet for any component of your choice. Assume component drawing dimensions and sequence of operations. 8
- b) Define process control and explain outline functions of production control. 8

OR



6. a) What is priority sequencing ? What are the different priority sequencing rules and criteria to choose sequencing ? 8
- b) Draw the block diagram of process engineering frame work and explain what is process planning ? 8

SECTION – II

Unit – IV

7. a) Explain Master Production Schedule (MPS) in detail. 9
- b) What are the different aspects of make or buy decisions ? 9

OR

8. a) Explain any three documents used in purchasing. 9
- b) Explain stages of ERP development (Evolution) as per the need add development in the manufacturing field. 9

Unit – V

9. a) Explain ABC analysis in brief. 8
- b) Annual demand for a product is 65000 units. The carrying cost is Rs. 10/- units/year, the ordering cost is Rs. 65/- per order and the shortage cost is Rs. 25 unit/year. Find the optimal values of the following :
- i) Order quantity 2
 - ii) Cycle time 2
 - iii) Maximum level 2
 - iv) Represent the system graphically. 2

OR



10. a) Derive EOQ formula for the inventory model without shortage. Represent it graphically. **8**
- b) A purchase manager adopts the policy to place an order for a minimum quantity of 900 of a particular item in order to avail a discount of 14 percent. It was found from the company record that for last 10 orders were placed each of size 400 Nos., ordering cost is Rs. 750/- per order. Inventory carrying charges at 20 percent and cost per unit is Rs. 400/-
- Is the purchase manager justified in his decision ?
- What is the effect of this decision on the company ? **8**

Unit – VI

11. a) Define waste, scrap, obsolete and surplus material. Why these are arising in the industries ? **8**
- b) Explain vendor development concept used in purchasing. **8**
- OR
12. a) Explain different types of stores. What are the objectives of store keeping ? **8**
- b) Explain in brief “Value Stream Mapping”. **8**



T.E. (Production) (Semester – II) Examination, 2011
MACHINE TOOLS AND ADVANCE MANUFACTURING SYSTEMS
(2003 Course)

Time : 3 Hours

Max. Marks : 100

- Instructions :* 1) From Section I solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6 and from Section II 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) **Neat** diagrams must be drawn **whenever** necessary.
4) **Use of electronic pocket calculators is allowed.**

SECTION – I

1. Referring to Fig. No.1, design the set of plate type of cams for a single spindle automatic machine. Assume suitable machining parameters depending upon the type of material to be machined. Include the information on the chart and draw the layout for turret cam.

18

Material : Mild steel

Name of part : Gauge

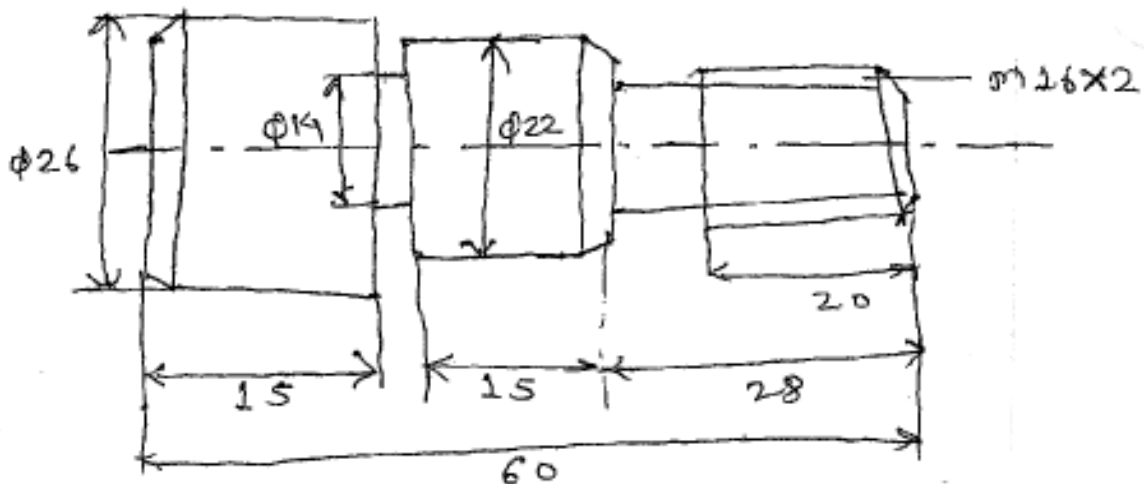


Fig. No. 1

All dimensions are in mm
All chamfers are $1 \times 45^\circ$
Figure is not scale.

OR

P.T.O.



- 2. a) Classify single spindle automatic machine and explain with neat sketch single spindle automatic bar machine. 8
- b) Explain parallel and progressive action multi-spindle machine with neat sketches. 10
- 3. a) Explain difference between NC and CNC machines and give applications of each. 8
- b) Discuss closed loop control system in detail. 8
- OR
- 4. a) What do you understand by axes designation in NC machines ? Describe the motion direction on a three axis milling machine. 8
- b) Discuss absolute and incremental co-ordinate systems. 8
- 5. a) What is the principle of electroplating ? What are its advantages ? 8
- b) Explain reasons for using different surface coatings on the materials. 8
- OR
- 6. a) Explain in detail CVD. 8
- b) Write short notes on : 8
 - i) Micro-machining
 - ii) Nano machining.

SECTION – II

- 7. a) What do you understand from precedence diagram and precedence matrix ? 8
- b) Discuss automated storage and retrieval system. 8
- OR
- 8. a) What are the different part feeding devices used in automated flow lines ? 8
- b) Following problem relate to the assembly line balancing in electronic goods assembly shop. If the work stations are limited to 3, find out the cycle time and balance delay in percentage. 8

	A	B	C	D	E	F	G
Time (min.)	.62	.39	.27	.14	.56	.35	.28
Predecessors	–	A	B	C	C	D,E	F



9. a) Describe difference between fixed automation, programmable automation and flexible automation. **8**
- b) What is Product Flow Analysis (PFA) ? Explain in detail. **8**
- OR
10. a) Discuss flexible manufacturing systems. Explain components of FMS. **8**
- b) Explain classification of robot on the basis of configuration and related work volume with the help of self-explanatory sketches. **8**
11. a) State the functions and requirements of control systems in machine tools. **8**
- b) Explain with a neat sketch the adaptive control system in CNC machine. **10**
- OR
12. a) Explain the importance of proper installation of the machine tool. **8**
- b) Discuss preventive and brake down maintenance in detail. **10**
-



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**T.E. Biotechnology Examination, 2011
GENETICS ENGINEERING
(2008 Pattern)**

Time : 3 Hours

Max. Marks : 100

- N.B. :** i) Answer Q. No. 1 or Q. No. 2, Answer Q. No. 3 or Q. No. 4, Answer Q. No. 5 or Q. No. 6, Answer Q. No. 7 or Q. No. 8, Answer Q. No. 9 or Q. No. 10, Answer Q. No. 11 or Q. No. 12.
ii) Answer to the **two** Sections should be written in **separate** answer books.
iii) **Neat** diagrams must be drawn **wherever** necessary.

SECTION – I

1. Discuss the components of “Polymerase Chain Reaction”. With the help of a neat labeled diagram, explain the process of DNA amplification during the same. **18**

OR

2. Give a detailed classification of restriction enzymes. With the help of a neat labeled diagram explain the role of restriction enzyme in gene cloning. **18**
3. What are multiple cloning sites ? Explain their significance in genetic engineering. **16**

OR

4. Answer the following (8 Marks each) : **16**
 - a) Plasmids are a powerful tool for expressing heterologous proteins in prokaryotic systems. Justify.
 - b) What are artificial chromosomes ? Explain with an example.
5. Write notes on the following (8 Marks each) : **16**
 - a) Explain the use of “Selection Markers” in selection of recombinants.
 - b) Reverse Transcriptase PCR helps in studying protein expression profile of an organism : Justify.

OR

P.T.O.



6. Write short notes on (**any four**) (4 Marks **each**) : **16**
- a) Flow cytometry
 - b) Cosmids
 - c) Significance of DNA ligase in PCR
 - d) cDNA synthesis
 - e) Eukaryotic cloning vectors.

SECTION – II

7. With a neat labeled diagram, explain the process of DNA sequencing using the Sanger's method. Add a note on automated sequencing method. **18**

OR

8. Give an account of different methods of gene isolation. **18**

9. What is BT Cotton ? Explain role of genetic engineering in development of BT Cotton. **16**

OR

10. Explain the following processes (**8 Marks each**) : **16**

- a) Bacterial Transformation
- b) Conjugation as a method of in-vitro gene transfer.

11. Discuss the following (**8 Marks each**) : **16**

- a) What are transgenic animals ? Explain their significance in biotechnology.
- b) What is Human Genome Project ? Discuss its significance with respect to human health.

OR

12. Write short notes on (**any four**) (4 Marks **each**) : **16**

- a) Gene Therapy
- b) RAPD
- c) Restriction Fragment Length Polymorphism
- d) Southern blotting
- e) Live vaccines.



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**T.E. (Biotechnology) (Semester – I) Examination, 2011
FERMENTATION TECHNOLOGY – I
(2008 Pattern)**

Time : 3 Hours

Max. Marks : 100

- N.B. :** i) Answer **three** questions from Section I and **three** questions from Section II.
ii) Answers to the **two** Sections should be written in **separate** answer books.
iii) **Neat** diagrams must be drawn **wherever** necessary.
iv) Figures to the **right** indicate **full** marks.
v) Assume suitable data, **if necessary**.

SECTION – I

1. Draw a generalized schematic representation of a typical fermentation process and explain each step in brief. 16

OR

2. a) Enlist preservation techniques of industrially important micro-organisms and explain each in detail. 12

- b) Enlist the criteria essential for the culture used as a inoculum. 4

3. What is a need for sterilization ? Enlist methods of medium sterilization and discuss kinetics of sterilization in detail. How will you design batch sterilization process ? Explain. 18

OR

4. For medium optimization Plackett – Burman experimental design model was used, twelve different trials were made with process variables and laccase activity was measured after 12 days of fermentation at 30 ° C temperature and pH 5.0 in following table. The row in the table represents the 12 different trials and each column represents a different variable as follows :

moisture content, (A) ; groundnut shell, (B) ; cyanobacterial biomass, (C) ; initial pH of the medium (D) ; temperature, (E) ; CuSO₄, (F) ; MgSO₄, (G) ; KH₂PO₄, (H). Find out the variables having maximum effect on production of laccase enzyme. 18

P.T.O.



RUN	A	B	C	D	E	F	G	H	Activity (U)
1	+	-	+	+	-	+	-	-	
2	+	+	-	+	+	-	+	-	312.67
3	-	-	+	+	+	-	+	+	288.51
4	-	+	+	+	-	+	+	-	307.08
5	-	+	-	-	-	+	+	+	352.10
6	+	+	+	-	+	+	-	+	305.02
7	-	-	-	+	+	+	-	+	277.15
8	-	+	+	-	+	-	-	-	329.42
9	-	-	-	-	-	-	-	-	275.04
10	+	-	-	-	+	+	+	-	260.18
11	+	-	+	-	-	-	+	+	297.65
12	+	+	-	+	-	-	-	+	290.88

5. Write short notes on following production processes (any 2, 8 M each) : 16
- i) Citric acid ii) Vinegar
 iii) Beer iv) Glycerol.

SECTION – II

6. Describe in detail production of Penicillin with flow diagrams. 18
- OR

7. Enlist industrially important enzymes. Write in detail production process of one of them. 18

8. a) Draw a labelled diagram of industrial aerobic fermenter. Explain each part of fermenter. 8
- b) Differentiate between SLF and SSF with their advantages and disadvantages. 8

OR

9. Which types of fermenter are used in solid state fermentation ? Explain each one of them in detail. 16

10. Write short notes on (any 2, 8 marks each) : 16
- i) Scale up
 ii) Downstream processing
 iii) Fermentation efficiency
 iv) Economics of fermentation.



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**T.E. (Biotechnology) (Semester – I) Examination, 2011
COMPUTATIONAL TECHNIQUES AND BIostatISTICS
(2008 Pattern)**

Time : 3 Hours

Max. Marks : 100

- Instructions :** 1) Figures to the **right** indicate **full** marks.
2) Use of Programmable calculator is not **allowed**.
3) Draw a neat sketch **wherever** necessary.
4) Make **necessary** assumptions **wherever** required.
5) Answer **any three** questions from Section – I and **any three** questions from Section – II

SECTION – I

1. a) Find the constants “a” and “b” by least squares method to fit straight line of the form $Y = a + bx$ using following data. **9**

x	0	1	2	3
y	2	5	8	11

- b) Fit a function of the form $y = ax^b$ to the following data. **9**

x	2	4	7	10	20	40	60	80
y	43	25	18	13	8	5	3	2

OR

2. a) Use the method of least squares to fit the curve $f(x) = c_0x + c_1/\sqrt{x}$ for the following **9**

x	0.2	0.3	0.5	1	2
f(x)	16	14	11	6	3

- b) Obtain the quadratic least square polynomial approximation to the following data. **9**

x	0.2	0.4	0.6	0.8	1
y	0.108	0.164	0.316	0.612	1.1

P.T.O.



3. a) Determine $f(x)$ as a polynomial in x for the following data, using Newtons divided difference formula. 10

x	-4	-1	0	2	5
f(x)	1245	33	5	9	1335

- b) Evaluate $\Delta^2(ab^x)$. 6

OR

4. a) Find the number of men getting wages below Rs. 15 from the following data. 6

Wages in Rs.	0 – 10	10 – 20	30 – 40	40 – 50
Frequency	9	30	35	42

- b) Given $u_1 = 40, u_3 = 45, u_5 = 54$, find u_2 and u_4 . 10

5. Find $\int e^{-x^2} dx$ between limits 0 and 0.6 by taking seven ordinates by using 16

- i) Simpson’s 1/3rd rule
- ii) Weddle’s rule
- iii) Trapezoidal rule
- iv) Simpson’s 3/8th rule.

OR

6. a) A reservoir discharging water through sluices at a depth “h” below the water surface has a surface area “A” for various values of “h” as given below. If “t” denotes time in minutes, the rate of fall of surface is given by $dh/dt = -48 h/A$. Estimate the time taken for the water level to fall from 14 to 10ft above the sluices. 8

h (ft):	10	11	12	13	14
A (sq.ft)	950	1070	1200	1350	1530

- b) The velocity of a particle at distance “s” from a point on its path is given by the table. Evaluate the time taken to travel 60 ft by using Simpson’s 1/3rd rule. Compare the result with the actual value. 8

s(ft)	0	10	20	30	40	50	60
v(ft/sec)	47	58	64	65	61	52	38



SECTION – II

7. Find the real root of $xe^x - 2 = 0$ correct to three decimal places by using **16**
- i) Newton's iterative method
 - ii) Regula falsi method.

OR

8. a) Find a root of the equation $e^x - x = 2$ lying between 1 and 1.4 by using bisection method correct to three decimal places. **8**
- b) Deduct Newton Raphson's iterative formula to find a root of $1/N$ and evaluate $1/18$ correct to two decimal places. **8**

9. Define Pie diagram. What are the limitations of pie diagram ? Draw a pie diagram for the following statistics. **16**

Agricultural and rural development	12.9%
Irrigation etc.	12.5%
Energy	27.2%
Industry and minerals	15.4%
Transportation, communication etc.	15.9%
Social services and others.	16.1%

OR

10. a) Write short notes on : **8**
- i) Law of statistical regularity.
 - ii) Law of inertia of large numbers.
- b) Explain in detail on merits and limitations of sampling. **8**



11. a) In an experiment on Immunization of cattle from tuberculosis, the following results were obtained. Calculate Chi square and discuss the effect of vaccine in controlling susceptibility to tuberculosis. 5% value of Chi square for one degree of freedom $\chi = 3.84$.

10

	Affected	Not affected
Inoculated	12	26
Not inoculated	16	6

- b) Calculate the deviation and its coefficient of the two income groups of five and seven members respectively.

8

I (Rs.)	4,000	4,200	4,400	4,600	4,800		
II (Rs.)	3,000	4,000	4,200	4,400	4,600	4,800	5,800

OR

12. Two laboratories A and B carry out independent estimates of fat content in ice cream made by a firm. A sample is taken from each batch, halved and then separated halves are sent to laboratories. The fat content obtained from laboratories is recorded below. Is there a significant difference between the mean fat content obtained by two laboratories A and B ? Data given as :

18

Degrees of freedom	6	7	8	9	10	16	18	20
5% value of t	1.45	2.36	2.31	2.26	2.23	2.12	2.10	2.09

Batch No.	1	2	3	4	5	6	7	8	9	10
Lab A	7	8	7	3	8	6	9	4	7	8
Lab B	9	8	8	4	7	7	9	6	6	6



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T.E. (Biotechnology) (Semester – I) Examination, 2011
MASS TRANSFER
(2008 Pattern)

Time: 3 Hours

Max. Marks: 100

- Instructions:**
- 1) Figures to the **right** indicate **full** marks.
 - 2) Use of Programmable calculator is **not allowed**.
 - 3) Draw a **neat** sketch **wherever** necessary.
 - 4) Make necessary assumptions **wherever** required.
 - 5) Answer **any three** questions from Section I and **any three** questions from Section II.
 - 6) **Use** graph sheets wherever required.

SECTION – I

1. Explain various theories of Mass Transfer at fluid surfaces ? Give necessary equations. **16**

OR

2. a) An experimental setup consists of a beaker of 1000ml distilled water. Inside this beaker, a porous pot is arranged such that it contains 25 ml of acetic acid. Calculate the rate of diffusion of acetic acid across a film of non diffusing water solution 1 mm thick at 17°C. The concentration on opposite sides of the film is 9 wt% and 3 wt% respectively. Diffusivity of acetic acid in solution is $0.958 \times 10^{-9} \text{m}^2/\text{sec}$. Density of 9wt% solution at 17°C is 1012Kg/m^3 , density of 3wt% solution at 17°C is 1003.2Kg/m^3 . **10**
- b) Give short notes on unsteady state diffusion in solids ? **6**
3. a) Write short notes on Differential distillation. Derive Rayleigh's law for the case of constant relative volatility. **10**
- b) 50 mole% n-heptane and 50 mole % n-octane were subjected to differential distillation at atm pressures with 60 mole% of the liquid distilled. Compute the composition of the composited distillate and residue. Average relative volatility is 2.16 at 1 atm. Equilibrium data is given as **6**

X	0.50	0.46	0.42	0.38	0.34	0.32
Y*	0.689	0.648	0.608	0.567	0.523	0.497

OR

P.T.O.



4. A continuous column is to be designed to separate 350 gm moles/min of a binary mixture containing 40% by weight of benzene and 60% by weight toluene. The top product contains 97% by weight of benzene and bottom product contains 98% by weight of toluene. A reflux ratio of 3.5 moles to 1 mole of product is to be used. The feed is liquid entering the column at its boiling point.

i) Calculate the moles of overhead and bottom product.

ii) Determine the number of ideal plates.

16

x	0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
y	0	0.185	0.36	0.50	0.61	0.70	0.78	0.84	0.90	0.95	1.0

5. a) Write short notes with neat sketches on :

8

i) Jacketed Kettle reboilers

ii) Thermosyphon reboilers.

b) A simple batch still is used to distill 1000 kg of a mixture containing 60 mass% ethyl alcohol and 40 mass% of water. After distillation the bottom product contains 5 mass% of alcohol. Determine the composition of the overhead product, its mass and mass of the bottom product. Equilibrium data is with respect to weight percentage values. Equilibrium data is given as

10

x	5	10	20	30	40	50	60
y	36	51.6	65.5	71	74	76.7	78.9

OR

6. a) A binary mixture of benzene and toluene containing 40 mole % benzene is to be distilled at atmospheric pressure to recover 95% of benzene. Estimate the molal percentage of the mixture which should be distilled and the composition of the distillate obtained if the distillation is carried out by Flash vaporization. The average volatility of benzene to toluene in the temperature range involved is 2.5.

10

b) Write short notes on :

8

i) Total reflux ratio

ii) Optimum reflux ratio.



SECTION – II

7. a) Write short notes on : **6**
- i) Absorption factor and its limitations.
 - ii) $(L/G)_{\min}$ for absorbers.
- b) Gas from a petroleum distillation column has its concentration of H_2S reduced from $0.03 \text{ kmol } H_2S/\text{Kmol inert hydrocarbon gas}$ to 1% of this value by scrubbing with a tri ethanol amine water solvent in a counter current tower of height 7.79 m operating at 300°K and atm pressure. The equilibrium relation may be taken as $Y = 2X$ where $Y = \text{K mol } H_2S/\text{Kmol inert gas}$ and $X = \text{K mol } H_2S/\text{K mol solvent}$. Pure solvent enters the tower and leaves containing $0.013 \text{ Kmol } H_2S/\text{K mol solvent}$. If the flow of inert hydrocarbon gas is $0.015 \text{ K mole}/\text{m}^2 \text{ sec.}$ and gas phase resistance controls the process, calculate overall coefficient for absorption $K_{G,a}$? **10**

OR

8. a) Derive the material balance equations for one component transferred in cocurrent direction in a given absorber. **8**
- b) Write short notes on : **8**
- i) Solubility curves
 - ii) Absorption in multi component systems.
9. a) Derive the expression for the total drying time θ_T of a wet solid in a tray dryer if **16**
- X_1 = Initial moisture content
- X_2 = Final moisture content
- X_c = Critical moisture content
- X_e = Equilibrium moisture content.

OR



10. It is desired to dry a certain type of fiber board in sheets $0.131\text{M} \times 0.162\text{m D} \times 0.071\text{ m}$ from 58% to 5% moisture (wet basis) content. Initially from laboratory test data with this fiber board, the rate of drying in constant rate drying period was found to be $8.9\text{ Kg/m}^2\text{ hr}$. The critical moisture content was 24.9% and the equilibrium moisture content was 1%. The fiber board is to be dried from one side only and has a bone dry density of 210 Kg/m^3 . Determine the time required for drying. The falling rate may be assumed to be linear. **16**
11. a) Explain in detail the equipment used for super saturation by evaporation. **10**
- b) Briefly explain the methods of super saturation ? **8**

OR

12. A crystallizer is charged with 7500 Kg of an aqueous solution at 377°K , 29.6% by weight of which is anhydrous Na_2SO_4 . The solution is cooled. During the cooling operation 5% of the initial water was lost by evaporation. As a result crystals of $\text{Na}_2\text{SO}_4 \cdot 10\text{H}_2\text{O}$ crystallize out. If the mother liquor is found to contain 18.3wt% anhydrous Na_2SO_4 , calculate the yield of the crystals and the quantity of mother liquor ? **18**



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T.E. (Biotechnology) Examination, 2011
REACTION ENGINEERING
(2008 Pattern)

Time : 3 Hours

Max. Marks : 100

- Instructions :** 1) Figures to the **right** indicate **full** marks.
2) Use of programmable calculator is **not allowed**.
3) Draw a **neat** sketch **wherever** necessary.
4) Make **necessary** assumptions **wherever** required.
5) Answer **any three** questions from Section **I** and **any three** questions from Section **II**.

SECTION – I

1. a) Write short notes with suitable example on the following : 8
i) Molecularity
ii) Order of reaction
iii) Series reaction
iv) Parallel reaction.
- b) Use collision theory to estimate the specific reaction rate for the decomposition of hydrogen iodide, $2\text{HI} = \text{I}_2 + \text{H}_2$ at 594.6°K . Assume that the collision diameter is 3.5\AA and activation energy of $44,000 \text{ cal/gmol}$. Evaluate the frequency factor. Given $R_g = 1.98 \text{ cal/(gmol) K}$. 8

OR

2. a) Discuss how temperature dependency influences activation energy ? 8
- b) A human being of 75Kgs consumes about 6000 KJ of food per day. Assume that the food is all glucose and the overall reaction is $\text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2 = 6\text{CO}_2 + 6\text{H}_2\text{O}$, $-\Delta H_r = 2816\text{KJ}$. Find man's metabolic rate in terms of oxygen used per m^3 of person per second ? 8
3. a) Write short notes on : 8
i) Space velocity
ii) Holding time and space time for flow reactors.
- b) A homogeneous gas reaction $\text{A} = 3\text{R}$ at 215°C has the rate $-r_A = 10^{-2}C_A^{1/2}$ (mol/lit.sec). Find the space time needed for 80% conversion of a 50% A and 50% inert feed to a plug flow reactor operating at 215°C and 5atm. $C_{A0} = 0.0625\text{mol/lit}$. 8

OR

P.T.O.



4. Obtain the equations relating time, initial concentration and conversion of an ideal batch reactor for the following cases : **16**
- i) Constant density systems
 - ii) Variable density systems.
5. a) Considering laminar flow conditions with first order reaction with $k = 0.1 \text{ s}^{-1}$ and $\theta = 10 \text{ s}$ taking place calculate the conversion in the following reactors. **9**
- i) Plug flow reactor
 - ii) Stirred tank reactor.
- b) Derive expressions for residence time distribution for the following functions : **9**
- i) Step input method
 - ii) Pulse input method.

OR

6. a) Does degree of segregation influence conversion and product distribution in batch reactor and plug flow reactor ? Why ? **10**
- b) Derive the expression for calculating E curve ? **8**

SECTION – II

7. Derive the expression relating time and conversion for shrinking core model for cylindrical particles of radius “R” and length “L” of unchanging size for the following cases. **16**
- i) Diffusion through gas film controls
 - ii) Chemical reaction controls.

OR

8. a) Calculate the time needed to burn spherical particles of graphite in 12% oxygen stream at 900°C at 1 atm completely when the radius of graphite particle is 12 mm and bulk density is 2.4 g/cm^3 . Surface reaction rate constant is $k = 25 \text{ cm/s}$. Gas film resistance is assumed to be negligible. **8**
- b) Two samples of solid are kept in a constant environment oven for a period of 1 hr. 4 mm particles are 57.8% converted and 2 mm particles are 87.5% converted. **8**
- i) Find the rate controlling mechanism for conversion of solids ?
 - ii) Find the time required for complete conversion of 1 mm particle in this oven ?



9. a) Particles of uniform size are 60% converted in a single fluidized bed as per the shrinking core model with reaction controlling. Find the conversion if the reactor is made twice as large but containing same amount of solids with same gas environment ? **8**
- b) Describe the various contacting patterns in fluid solid reactors ? **10**

OR

10. a) Give short notes on the following : **10**
- i) Slurry reactor
 - ii) Packed bed catalytic reactor.
- b) Discuss the significance and limiting cases for Thiele modulus ? **8**
11. a) Explain different type of inhibitors encountered in enzyme kinetics ? **8**
- b) Substrate A and enzyme E flow through a mixed flow reactor of volume 6 liters. Find a rate equation to represent the action of enzyme on the substrate using the following data : **8**

C_{EO} , mol/lit	C_{AO} , mol/lit	C_A , mol/lit	V , l/h
0.02	0.2	0.04	3
0.01	0.30	0.15	4
0.001	0.69	0.60	1.2

OR

12. Write short notes on : **16**
- i) Monod growth kinetics
 - ii) Enzyme deactivation kinetics
 - iii) Competitive inhibition
 - iv) Factors effecting growth kinetics.



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**T.E. (Biotechnology) Examination, 2011
FERMENTATION TECHNOLOGY – II
(2008 Course)**

Time : 3 Hours

Max. Marks : 100

- N.B. :** i) Answer **three** questions from Section I and **three** questions from Section II.
ii) Answers to the **two** Sections should be written in **separate** answer books.
iii) **Neat** diagrams must be drawn **wherever** necessary.
iv) Figures to the **right** indicate **full** marks.
v) Assume suitable data, if **necessary**.

SECTION – I

1. Explain in detail any four factors effecting fermenter performance. **18**
OR
2. a) Write short notes on effect of aeration and agitation in fermentation broths. **9**
b) Describe in detail Sulphite oxidation method for the measurement of K_{La} in fermentation broths. **9**
3. Explain the need of different unit operations for processing fermentation products. **16**
OR
4. Explain in detail Principle, Construction, Working of Airlift bioreactors with neat sketch. List out its applications. **16**
5. a) Give a detailed explanation of breakthrough curve of adsorption operation with a neat sketch. **8**
b) Write short notes on types of adsorption with proper examples. **8**
OR
6. Derive the material balance equations for multistage crosscurrent adsorption. Determine the minimum amount of adsorbent required in a multistage crosscurrent adsorption operation. **16**

P.T.O.



SECTION – II

7. a) Write short notes on the working method of countercurrent multiple contact method/shanks system of leaching operations with a neat sketch. **9**
- b) Define leaching with an example. List out the various methods of preparing the solids before leaching operation. **9**

OR

8. Crushed oil seeds containing 55% by weight oil are to be leached at the rate of 4000Kg/hr using 6000Kg/hr of hexane containing 5% oil by weight as the solvent. A countercurrent two stage operation is used. Oil seeds retain 1Kg of solution per Kg of oil free cake. Calculate the percent recovery of oil obtained under above conditions. **18**

9. a) Explain in detail various methods to prevent membrane fouling. **8**
- b) Define Reverse osmosis. What are the membranes used in RO ? List out the industrial applications. **8**

OR

10. a) Give a detailed classification of membranes. **8**
- b) Write short notes on transport through cell membranes. **8**
11. a) Derive material balance calculations for multistage countercurrent extraction with neat sketch and assumption. **8**
- b) Define liquid extraction. Give the fields of usefulness of extraction when compared to other mass transfer operations. **8**

OR

12. a) Give a detailed explanation on construction and working of rotating disc contactors in extraction operations with a neat sketch. List out its applications. **8**
- b) Explain the factors affecting the choice of solvent in extraction operation. **8**



T.E. (Biotechnology) (Semester – II) Examination, 2011
BIOSEPARATIONS – I
(2008 Pattern)

Time : 3 Hours

Max. Marks : 100

- N.B. :*
- i) Answer **three** questions from Section I and **three** questions from Section II.*
 - ii) Answers to the **two** Sections should be written in **separate** answer books.*
 - iii) **Neat** diagrams must be drawn **wherever** necessary.*
 - iv) Figures to the **right** indicate **full** marks.*
 - v) **Assume** suitable data if **necessary**.*

SECTION – I

1. a) Give short notes on recovery of bio products. **9**
- b) Define ultrasonication. What are the factors effecting ultrasonication ? **9**
- OR
2. a) Give detailed notes on biological methods of Cell disruption. What are the advantages of biological methods of cell disruption compared to other conventional methods ? **9**
- b) Explain how centrifuges are used in separation by taking example of any one centrifuge with a neat sketch. **9**
3. a) Write short notes on the following methods of chromatography. **12**
- i) Frontal analysis
 - ii) Displacement analysis
- b) What are the principles of paper chromatography ? What are the factors effecting paper chromatography ? **4**

OR

P.T.O.



4. a) Classify the chromatographic techniques based on stationary and mobile phases. Also give the principle of separation and application of each of them. **12**
- b) Define the following with suitable formulae : **4**
- i) Capacity factor
- ii) Relative retention.
5. a) Derive the expression for time required for centrifugal separation of a basket centrifuge with a neat sketch. **8**
- b) Define the following : **8**
- i) Water flux in reverse osmosis
- ii) Salt flux in reverse osmosis.

OR

6. a) Derive the expression for terminal velocity in centrifugal sedimentation. **8**
- b) The specific resistance of the cake of biomass was found to vary with pressure drop as follows. Find the compressibility of the cake. **8**

Pressure drop (KN/m ²)	330	134.3	46.1	21.1
Cake resistance (m/Kg)*10 ⁻¹¹	3.56	2.16	1.45	1.07

SECTION – II

7. a) Give the applications of aqueous two phase extraction. **9**
- b) Give a brief account on methods of super saturation to bring out crystallization. **9**

OR



8. a) What are the theoretical considerations involved in drying of products ? **10**
- b) Explain in detail Lyophilisation. Explain the working procedure of batch freeze dryers. **8**
9. What is the scope of Bio separation techniques in research ? **16**
- OR
10. Discuss the importance of separation techniques in biotechnology. **16**
11. Discuss the processes used for the separation and purification of secondary metabolites. **16**
- OR
12. Write short notes on separation of bioconversion products. **16**
-



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**T.E. Biotechnology, Examination, 2011
IMMUNOLOGY AND DIAGNOSTICS
(2008 Pattern)**

Time : 3 Hours

Max. Marks : 100

- N.B. :* i) Answer Q. No. 1 or Q. No. 2, Answer Q. No. 3 or Q. No. 4, Answer Q. No. 5 or Q. No. 6, Answer Q. No. 7 or Q. No. 8, Answer Q. No. 9 or Q. No. 10, Answer Q. No. 11 or Q. No. 12.
ii) Answer to the **two** Sections should be written in **separate** answer books.
iii) Neat diagrams must be drawn **wherever** necessary.

SECTION – I

1. Describe the various components of Innate immune system. Add a note on “Three lines of defence in humans”. 18
- OR
2. Explain in detail the structure, function and location of lymphoid organs in humans. 18
3. Describe the structure and chemical nature of a typical antibody. Add a note on clonal selection. 16
- OR
4. Answer the following : (8M each) 16
- a) Hybridoma technology can be used for large scale production of monoclonal antibodies. Justify.
- b) Explain the principle and procedure for Western Blotting.
5. Write notes on : (8M each) 16
- a) Explain the role of MHC in immune system.
- b) Cell mediated immunity is specific and adaptive. Justify.

OR

P.T.O.



6. Write short notes on (**any four**) : **(4M each) 16**
- a) RIA
 - b) ELISA
 - c) Inflammatory responses
 - d) Antigen presenting cells
 - e) Types of T cells

SECTION – II

7. Describe the various complement activation pathways. Also explain the role of antibodies in complement activation. **18**

OR

8. Describe the mechanism of hypersensitivity in humans. Add a note on Type I and II reactions. **18**

9. With the help of a tree diagram explain different types of immunization mechanisms in humans. **16**

OR

10. Answer the following : **(8M each) 16**

- a) What are DNA vaccines ? What are advantages of DNA vaccines over conventional ?
- b) Write a note on types of immunoglobulins naturally produced by human body.

11. Answer the following : **(8M each) 16**

- a) An HIV infected person may not be suffering from AIDS immediately after the infection. Justify.
- b) What are cytokines ? Explain their significance in immune reactions.

OR

12. Write short notes on (**any four**) : **(4M each) 16**

- a) Toxoids
 - b) Tuberculosis
 - c) ADCC
 - d) Subunit vaccines
 - e) AIDS Related Complex.
-



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T.E. (Semester – II) (Production/Production S/W) Examination, 2011
MANUFACTURING PROCESSES – II
(2003 Course)

Time : 3 Hours

Max. Marks : 100

- Instructions :** 1) From Section I, Solve Q. 1 or Q. 2, Q. 3 or Q. 4, Q. 5 or Q. 6, and Section – II, Solve 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) Neat diagrams must be drawn **wherever** necessary.
4) Black figures to the **right** indicate full marks.
5) **Assume** suitable data, **if necessary**.

SECTION – I

1. a) What are the differences between TIG and MIG welding processes ? **8**
b) What is the importance of the flux in welding operation ? Explain different types of fluxes used. **8**

OR

2. a) Explain with suitable sketch Heat Affected Zone (HAZ) related with arc welding process. **8**
b) Discuss non-conductor ferrule method and semi-conductor cartridge method with neat sketch in stud welding. **8**
3. a) Explain principle of resistance welding and discuss applications of resistance welding. **8**
b) Discuss with sketches types of flames used in gas welding. **8**

OR

4. a) Explain the principle of oxy-fuel gas cutting. How is a gas cutting torch differ from welding torch ? **8**
b) Explain projection and upset welding with sketches. **8**
5. a) Compare soldering, brazing and braze welding. **9**
b) Write short note on fluxes used in soldering and brazing. **9**

OR

6. a) Compare Electron Beam welding with Laser Beam welding. **9**
b) Discuss with sketches ultrasonic and thermit welding. **9**

P.T.O.



SECTION – II

- 7. a) Explain the importance of gating system in casting. 6
- b) Discuss the importance of following in achieving the directional solidification in casting by 10
 - i) Location of risers
 - ii) Exothermic materials
 - iii) Chills

OR

- 8. a) Explain gating ratio, pressurized and non pressurized Gating systems. 8
- b) Differentiate between progressive and direction solidification with neat sketches. 8
- 9. a) State different methods of thread cutting and explain hand tapping and machine tapping. 8
- b) Explain gear shaping with neat sketch and write advantages, limitations and applications of gear shaping. 8

OR

- 10. a) Explain thread rolling and thread whirling. 8
- b) Discuss gear hobbing process in detail. 8
- 11. a) Explain principle of VSM. 6
- b) Sketch and explain EDM process. 6
- c) Compare EBM with LBM. 6

OR

- 12. a) Draw a schematic diagram of “Abrasive Jet Machining”. Explain principle, working and applications. 10
- b) Discuss with sketch material removal mechanism of ECM process and write its process parameters and applications. 8



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**T.E. (Biotechnology) (Semester – II) Examination, 2011
BIOINFORMATICS AND MANAGEMENT
(2008 Pattern)**

Time : 3 Hours

Max. Marks : 100

- N.B. :*
- i) Answer **three** questions from Section I and **three** questions from Section II.*
 - ii) Answers to the **two** Sections should be written in **separate** answer books.*
 - iii) **Neat** diagrams must be drawn **wherever** necessary.*
 - iv) **Figures** to the right indicate **full** marks.*
 - v) Assume suitable data, if **necessary**.*

SECTION – I

1. What is bioinformatics ? What is scope and goal of bioinformatics ? Explain in detail application of bioinformatics. **18**
- OR
2. What are databases ? Describe database system management. **18**
3. Write short notes on : (**any 4, 4 marks each**) : **16**
 - i) GenBank
 - ii) DDBJ
 - iii) EMBL
 - iv) EBI
 - v) SGD
 - vi) UniGene
 - vii) TDB
 - viii) Entrez.

P.T.O.



4. Explain levels of protein structural organisation also write in short about primary protein sequence databases. **16**

OR

5. Classify protein databases according to their applications and explain two databases from each category. **16**

SECTION – II

6. What do you mean by sequence alignment ? Explain in detail pairwise and multiple sequence alignment. **18**

OR

7. Write short notes on : **18**
- i) BLST
 - ii) FASTA

8. Explain phylogenic analysis with following points : **16**
- i) Homologs
 - ii) Orthologs
 - iii) Paralogs
 - iv) Construction of phylogenic tree and types of trees.

OR

9. What is drug designing ? Explain different methods of drug designing. **16**
10. Write short notes on : **(any 2, 8 marks each) : 16**
- i) Management studies
 - ii) Biotechnology Management
 - iii) Technology transfer management in Biotechnology
 - iv) Relation between bioinformatics and management.



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**T.E. (Automobile) (Semester – I) Examination, 2011
MACHINE DESIGN
(2008 Pattern)**

Time: 4 Hours

Max. Marks: 100

- Instructions:**
- 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 programmable calculator is not **permitted**.
 - 6) Assume suitable data, **if necessary**.

SECTION – I

1. a) Write a design procedure for square key. 6
- b) A transmission shaft is supported between two bearings, that are 750 mm apart. Power is supplied to the shaft through a coupling, that is located to the left of left-hand bearing. Power is transmitted from the shaft by means of a belt pulley, 450 mm diameter, which is located at a distance of 200 mm to the right of left-hand bearing. The weight of the pulley is 300N and the ratio of belt tension of tight and slack sides is 2 : 1. The belt tensions act in vertically downward direction. The shaft is made of steel F_eE300 ($S_{yt} = 300\text{N/mm}^2$) and the factor of safety is 3. Determine the shaft diameter, if it transmits 12.5 Kw power at 300 rpm from the coupling to the pulley. Assume ($S_{sy} = 0.5 S_{yt}$). 12

OR

2. A bushed-pin type flexible coupling is used to connect two shafts and transmit 5 Kw power at 720 rpm. Shafts, keys and pins are made of commercial steel ($S_{yt}=S_{yc} = 240\text{ N/mm}^2$) and the factor of safety is 3. The flanges are made of grey cast iron FG 200 ($S_{ut} = 200\text{ N/mm}^2$) and the factor of safety is 6. Assume, $S_{sy} = 0.5 S_{yt}$ and $S_{su} = 0.5 S_{ut}$. There are 4 pins. The pitch circle diameter of the pins is four times of shaft diameter. The permissible shear stress for pins is 35 N/mm^2 . The permissible bearing pressure for the rubber bushes is 1 N/mm^2 . The Key have square cross-section. Calculate,
- i) diameter of shafts
 - ii) dimensions of the key
 - iii) diameter of the pins
 - iv) outer diameter and effective length of the bushes. 18

P.T.O.



3. a) Why the efficiency of self-locking square threaded screw is less than 50% ? 6
- b) The nominal diameter of a triple-threaded square screw is 50 mm, while the pitch is 8 mm. It is used with a collar having outer diameter of 100 mm and inner diameter as 65 mm. The coefficient of friction at the thread surface as well as at the collar surface can be taken as 0.15. The screw is used to raise a load of 15 kN. Using the uniform wear theory for collar friction, calculate.
- i) torque required to raise the load ;
- ii) torque required to lower the load; and
- iii) the force required to raise the load, if applied at a radius of 500 mm. 10

OR

4. a) Explain the method of determining the size of the bolt when the bracket carries an eccentric load perpendicular to the axis of the bolt. 6
- b) A welded connection as shown in fig.1 is subjected to an eccentric force of 7.5 kN. Determine the size of welds if the permissible shear stress for the weld is 100 N/mm^2 . Assume static conditions. 10

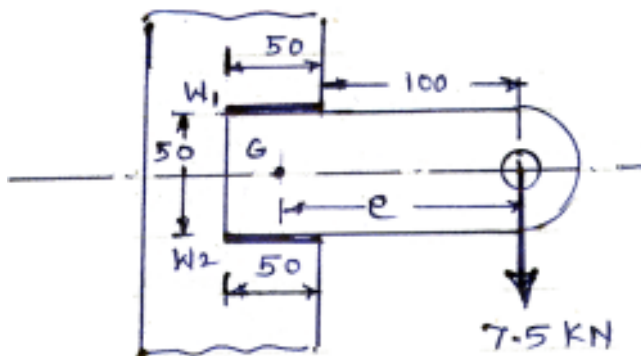


fig.1 Q.4(b)



5. a) Explain with neat sketch, how the stress concentration in a component can be reduced. 6
- b) A forged steel bar, 50 mm in diameter is subjected to a reversed bending stress of 250 N/mm^2 . The bar is made of steel 40C8 ($S_{ut}=600 \text{ N/mm}^2$). Calculate the life of the bar for a reliability of 90%. Assume following data :
- $K_a = 0.44$; $K_b = 0.85$
- For 90% reliability $K_c = 0.897$. 10

OR

6. a) Explain modified Goodman diagram for bending stresses ? 6
- b) The work cycle of a mechanical component subjected to completely reversed bending stresses consists of the following three elements.
- i) $\pm 350 \text{ N/mm}^2$ for 85% of time
- ii) $\pm 400 \text{ N/mm}^2$ for 12% of time, and
- iii) $\pm 500 \text{ N/mm}^2$ for 3% of time.
- The material for the component is 50C₄ ($S_{ut} = 660 \text{ N/mm}^2$) and the corrected endurance limit of the component is 280 N/mm^2 . Determine the life of the component. 10

SECTION – II

7. a) Derive load deflection equation for helical spring. 6
- 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 made of patented and cold drawn steel wire with ultimate tensile strength of 1500 N/mm^2 and modulus of rigidity of 81370 N/mm^2 . The permissible shear stress can be taken as 30% of the ultimate tensile strength. Design the spring and calculate ;
- i) wire diameter ii) mean coil diameter
- iii) number of active turns iv) free length and
- v) pitch of turns. 10

OR



8. a) explain construction of leaf spring with sketch. 6
- b) A semi-elliptic multi-leaf spring is used for suspension of vehicle. It consists of two extra full-length leaves and ten graduated length leaves including the master leaf. The centre-to-centre distance between the spring eyes is 1.2m. The leaves are made of steel ($S_{yt} = 1500 \text{ N/mm}^2$ and $E = 207000 \text{ N/mm}^2$) and the factor of safety is 2.5. The spring is to be designed for a maximum force of 30 KN. The leaves are pre-stressed so as to equalize stresses in all leaves. Determine.
- i) the cross-section of leaves and
- ii) the deflection at the end of the spring. 10
9. a) Explain the construction of hydrodynamic bearings and journals with the help of sketches. 6
- b) A hydrodynamic bearing has a diameter and length of 100 mm. The radial load on the bearing is 30KN. The journal speed is 1500 rpm and the radial clearance is 100 microns. If the viscosity of the oil is 25 cp; Determine
- i) minimum oil film thickness
- ii) Probable coefficient of friction
- iii) Power lost in friction
- iv) Quantity of OT/in circulation
- v) Side leakage.

Assume sp. gravity of oil as 0.86 and the specific heat as 2.09 kJ/kg°C.

Use the following table :

10



Total 1 : Performance parameters for Journal Bearings.

$\left(\frac{L}{D}\right)$	ϵ	$\frac{h^{\circ}}{c}$	s	ϕ	$\left(\frac{r}{c}\right)_f$	$\frac{\phi}{rcn_s L}$	$\frac{Q_s}{Q}$	$\frac{P}{P_{max}}$
1	0.4	0.6	0.264	63.10	5.79	3.99	0.497	0.484
	0.6	0.4	0.121	50.58	3.22	4.33	0.680	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

OR

10. a) Derive stribeck’s equation for the basic static capacity of bearing. State the assumptions made. 6

b) A single row deep-groove ball bearing is subjected to a radial force of 8 kN and a thrust force of 3 kN. The shaft rotates at 1200 rpm. The expected life of bearing is 20,000 hr. The diameter of shaft is 75 mm. Select suitable ball bearing for this application. Use following table for X and Y. 10

Table 2 : X and Y factors for single row deep groove ball bearings.

$\frac{F_a}{C_o}$	$\left(\frac{F_a}{Fr}\right) \leq e$		$\left(\frac{F_a}{Fr}\right) < e$		e
	X	Y	X	Y	
0.025	1	0	0.56	2.0	0.22
0.040	1	0	0.56	1.8	0.24
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



11. A spur gear pair, made of plain carbon steel 55 C8 ($S_{ut} = 720 \text{ N/mm}^2$ and $E = 210 \text{ GPa}$), is required to transmit 7.5 kW power from an electric motor running at 1440 rpm to a machine running at 370 rpm. The tooth system is 20° full-depth involute and number of teeth on pinion are as minimum as possible. The service factor and load concentration factor are 1.25 and 1.2 respectively. The factor of safety required is 1.25 and 1.5. The face width is twelve times the module. The gears are to be machined to meet the specifications of grade 7. Design the gear pair by using velocity factor and Buckingham's equation for dynamic load. Suggest the surface hardness. Minimum number of teeth on pinion = 18. Use following relations.

$$C_v = \frac{3}{3+V}; P_d = \frac{21V(bc+P_t \max)}{21V+\sqrt{bc+P_t \max}} \text{ N}$$

$$C = 0.111e^{\left[\frac{E_p \cdot E_g}{E_p + E_g} \right]}; \text{N/mm}$$

$$y = 0.484 - \frac{2.87}{z}$$

$$\text{For grade 7, } e = 11.0 + 0.9(m + 0.25\sqrt{d})$$

$$K = 0.16 \left(\frac{\text{BHN}}{100} \right)^2, \text{N/mm}^2$$

Recommended series of module (mm) -choice – 1

1, 1.25, 1.5, 2.0, 2.5, 3.0, 4.0, 5.0, 6.0, 8.0

18

OR



12. a) Derive an expression for formative number of teeth in helical gears. 6

b) A pair of parallel helical gears consists of a 20 teeth pinion meshing with a 100 teeth gear. The pinion rotates at 720 rpm. The normal pressure angle is 20° , while the helix angle is 25° . The face width is 40 mm and the normal module is 4mm. The pinion and gear is made of steel 40C8 ($S_{ut} = 600 \text{ N/mm}^2$) and heat treated to surface hardness of 300 BHN. The service factor and factor of safety are 1.5 and 2 respectively. Assume that the velocity factor accounts for the dynamic load and calculating the power transmitting capacity of gears.

Use following table for Lewis form factor 'Y'.

No. of teeth (Z)	Y
20	0.320
25	0.340
26	0.344
27	0.348
28	0.352
30	0.358
32	0.364

Use $C_v = 5.6 / (5.6 + \sqrt{v})$, where v= pitch line velo, m/s.

12



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T.E. (Production) (Semester – II) Examination, 2011
METROLOGY AND QUALITY CONTROL
(2003 Course)

Time: 3 Hours

Max. Marks: 100

- Instructions :** 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.

SECTION – I

1. a) Describe the use of four balls and height gauge for finding the diameter of the base. **8**
b) Differentiate between systematic error and random error. **6**
c) Define 'Metrology' and explain interchangeability. **4**

OR

2. a) Describe the optical principle of angle dekor and explain with the set up of checking the angle of V block by using angle dekor. **10**
b) Explain classification of slip gauges according to type/accuracy and grades and how will you calibrate the slip gauges ? **8**
3. a) Differentiate between :
i) Inspection gauges and workshop gauges
ii) Go plug gauge and No Go plug gauge **8**
b) Differentiate between circularity and roundness. **4**
c) Define : squareness, parallelism. **4**

OR

P.T.O.



4. a) Explain with neat sketch High magnification comparator. **8**
 b) Differentiate between comparator, measuring instrument, and gauges. **8**
5. a) Explain various methods for the examination of surface texture. **8**
 b) Derive the equation $d = m \left[1 - \frac{\pi}{4} \sin \phi \cos \phi \right]$ for constant chord method. **8**

OR

6. a) Derive the relation for following two wire method equations :
 i) P value = $0.866p - d$
 ii) $db = P/2 \sec \frac{\theta}{2}$ **10**
- b) Explain co-ordinate measuring machine. **6**

SECTION – II

7. a) Differentiate between quality control, quality assurance, inspection and testing. **10**
 b) Explain the different functions of quality planning. **4**
 c) Explain technique of field complaint analysis. **4**

OR

8. a) Explain 14 points of Deming's Quality approach. **9**
 b) Explain with help of Juran tribology and quality approach. **9**
9. a) Explain types of Attribute control charts. **8**
 b) Explain the importance of SQC. **4**
 c) Explain uses of \bar{X}, \bar{R} charts. **4**

OR



10. Explain 7 quality control tool for problem solving technique. **16**
11. a) What are the characteristics of good sampling plan ? **3**
- b) Draw only flow charts for Acceptance sampling plan. **9**
- i) Single sampling plan
 - ii) Double sampling plan
 - iii) Sequential sampling plan.
- c) Explain Advantage of ISO 9000. **4**

OR

12. a) For the following Data calculate sample size, AOQ for single sampling plan
- i) Probability of acceptance for 0.4% is 0.558
 - ii) Lot size $N = 10,000$ units
 - iii) Acceptance number $c = 1$
 - iv) $np = 1.5$
 - v) Defectives found in the sample are not to be replaced. **6**
- b) Explain in brief : **10**
- i) ISO 9001
 - ii) Malcom bal bridge quality award.



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T.E. Production (Semester – II) Examination, 2011
DIE AND MOULD DESIGN
(Common with Prod. S/W)
(2003 Course)

Time : 4 Hours

Max. Marks : 100

- N.B.:**
- i) Answers to the *two* Sections should be written in *separate* answerbooks.
 - ii) *Neat* diagrams must be drawn *wherever* necessary.
 - iii) Figures to the **right** indicate **full** marks.
 - iv) Use of electronic pocket calculator is **allowed**.
 - v) Assume suitable data, **if necessary**.

SECTION – I

1. a) Sketch the assembly drawing of a progressive die for the component shown in Figure 1 6
- Given : stock thickness = 1 mm, Shear strength of material = 260 MPa.
- b) Draw best strip layout and find material utilization, assume sheet of size 2500 mm × 1250 mm. 6
- c) For above layout find out press tonnage with staggering. 3
- d) If full shear is given what will be the press tonnage. 3

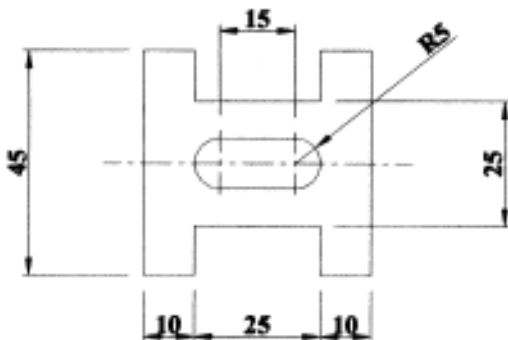


Fig: 1
Material: Al, 1mm thick

OR

P.T.O.



2. a) List the name of different types of stoppers and draw a neat sketch of it that used in design of progressive die of component shown in Fig. 1. 8
- b) Explain the methods of mounting of the punch and design and draw the punch plate for component shown in Fig. 1. 6
- c) What is mean by clearance ? Calculate it for the same problem. What is an effect of excessive and insufficient clearance in press working ? 4
3. Design a drawing die for the shell in fig. 2 16
 Given : blank thickness = 1.6 mm, UTS = 260 N/mm².
 Determine :
 - i) Blank size
 - ii) Number of draws
 - iii) Dimension of die and punch
 - iv) Force required and sketches for each draw.

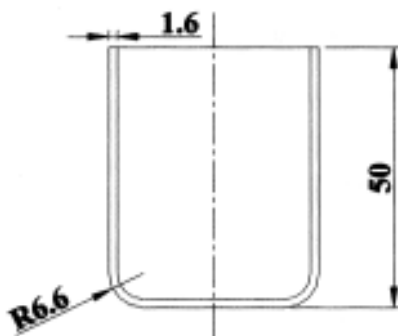


Fig: 2

OR

4. a) Find out the developed length of the component shown in fig. 4 6

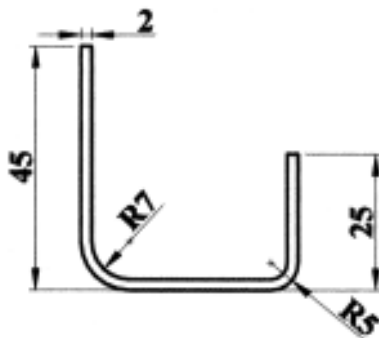


Fig: 4



- b) What are the methods of reducing spring back ? And which would be used for the component in fig. 4 ? 6
- c) Differentiate Coining and Embossing. 4
- 5. a) Explain with sketch the basic rules for die design in upsetting. 10
- b) Explain how stock size is calculated in forging. 6

OR

- 6. Design forging die for the forging shown in fig. 5. 16

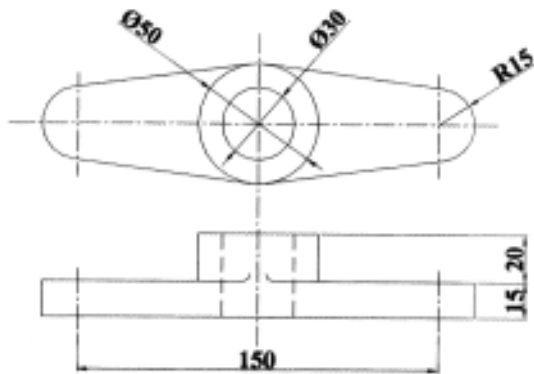


Fig. 5: Close die forging job

SECTION – II

- 7. a) Explain with neat sketch cold chamber die-casting. 8
- b) Explain gooseneck hot chamber die casting with neat diagram. 8

OR

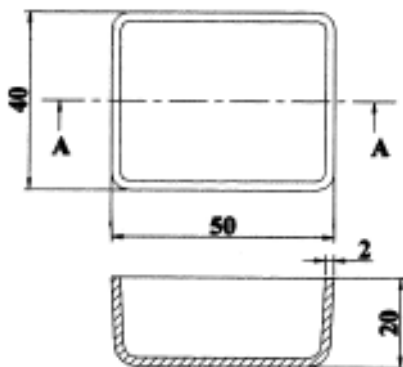
- 8. a) Explain with neat sketch ejection system in die-casting. 8
- b) Explain die locking methods in die casting with suitable sketches. 8

- 9. a) What is bolster ? What are their functions ? What are its different types explain with neat sketch ? 8
- b) Explain with neat sketch 8
 - i) Compression moulding
 - ii) Blow moulding.

OR



10. a) Explain cavity and core insert with neat sketch and also explain its method of fitting to bolster. **10**
- b) Explain the various method of cooling integer type core plate with suitable sketches. **6**
11. a) Design a single-impresion injection mould for the component shown in fig. 6 by considering following points **18**
- General construction
 - Ejection system
 - Feed system.
- What rectangular edge gate and 50 mm long runner dimensions are required ?
Given; PVC constant (n) = 0.9; PVC density = 1.39gm/cm³
- Cooling system.



Sec A-A

Fig: 6

OR

12. a) Explain various types of ejection in injection moulding. **10**
- b) Write short note on CAD application in mould design. **8**



[4063] – 40

**T.E. (Prod. Engg./Prod. S/W) (Semester – II) Examination, 2011
DATABASE AND INFORMATION TECHNOLOGY FOR
PRODUCTION ENGINEERING
(2003 Course)**

Time : 3 Hours

Max. Marks : 100

- Instructions :** 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) Black 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

1. a) What are the advantages and limitations of database processing ? **5**
b) Explain the entity-relationship model with a suitable example. **5**
c) Explain the various components of DBMS with a neat sketch. **6**

OR

2. a) What is a data constraint ? Explain column level and table level constraints with an example. **7**
b) Explain the following in brief : **9**
i) First order normalization
ii) Relational database management system
iii) Procedural and Non procedural languages.

Unit – II

3. a) Explain with an example the primary key and foreign key concepts in databases. **6**
b) Create a table 'emp' with the following columns by assuming suitable data type and size with correct syntax in SQL. Emp_id, Ename, City, State, Salary, Age, Hire_date. **4**

P.T.O.



- c) Give an expression in SQL to solve each of the following queries : **6**
- i) Find the names of all employees whose name starts with 'Sa'.
 - ii) List all the employees name and salary whose age is less than 40 years.
 - iii) Select the employees whose salary is between Rs. 20,000 and Rs. 30,000.

OR

4. a) Explain the use of compound conditions AND, OR, Joining in SQL programming with an example. **6**
- b) Explain the following with reference to SQL programming : **10**
- i) Principles of NULL value
 - ii) Grouping data from tables
 - iii) SQL operators (any four)

Unit – III

5. a) Distinguish between an algorithm and a program. What are the characteristics of an algorithm ? **8**
- b) Draw a flow chart and psedo C-code for calculating the sum of following series : **10**

$$f(x) = 1 + \frac{1}{2!} + \frac{1}{4!} + \frac{1}{6!} + \frac{1}{8!} + \frac{1}{10!} + \dots$$

OR

6. a) What is a computer network ? What are the characteristics of local area networks ? Explain in brief types of transmission media. **10**
- b) Write a loop that will calculate the sum of squares of all odd numbers between 1 and 10. Write the loop in two different ways :
- i) Using a 'for' statement
 - ii) Using a do-while statement. **8**



SECTION – II
Unit – IV

7. a) Describe the output generated by the following C-program. 6

```
# include <stdio.h>
int funct 1(int n);
main ()
{
    int n = 10;
    printf (“%d”, funct 1(n));
}
int funct 1 (int n)
{
    if(n > 0)
        return (n + funct 1 (n – 2));
}
```

b) Explain the meaning of each of the following function prototypes :

- i) int f(float a);
- ii) double f(double a, int b);
- iii) void f(long a, short b, unsigned c);
- iv) char f(void);

4

c) Find a real root of $x^3 - x = 1$ between 1 and 2 by bisection method. Compute five iterations. 8

OR

8. a) Draw a flow chart and psedo C-program to find the root of an equation using Newton-Raphson method. 10

b) Solve the following system of linear algebraic equations upto four decimal places using Gauss-Seidal method. Perform seven iterations. 8

$$27x + 6y - z = 85$$
$$6x + 15y + 2z = 72$$
$$x + y + 54z = 110$$



Unit – V

9. a) If 0.333 is the approximate value of $1/3$, find absolute, relative and percentage errors. 5
- b) If $u = \frac{4x^2y^3}{z^4}$ and errors in x, y, z be 0.001, compute the relative maximum error in u when $x = y = z = 1$. 5
- c) Calculate the value of $f(6)$ from the following data using Newton's interpolation formula : 6

x	1	2	7	8
f(x)	1	5	5	4

OR

10. a) The function $y = f(x)$ is given at the points (5, 12), (6, 13), (9, 14) and (11, 16). Find the value of y for $x = 10$ using Lagrange's interpolation formula. 8
- b) For the data given below, find the equation to the best fitting exponential curve of the form $y = a.e^{bx}$. 8

x	1	5	7	9	12
y	10	15	12	15	21

Unit – VI

11. a) Define electronic commerce. List the consumer's benefits of electronic commerce. 6
- b) What is electronic fund transfer ? How does it work ? 6
- c) Explain the difference between conventional and artificial intelligent computing. 4
- OR
12. a) What are intelligent agents ? What are the characteristics of intelligent agents ? 6
- b) Explain in brief the applications of IT in the following areas : 10
- i) Materials requirement planning
- ii) Project management.
- _____



[4063] – 40-B

T.E. Production S/W (Semester – II) Examination, 2011
PROCESS PLANNING AND INDUSTRIAL STATISTICS
(2003 Course)

Time : 3 Hours

Max. Marks : 100

SECTION – I

1. a) Explain Process Engineering. What are the functions of Process Engineering ? **16**
OR
b) Explain Part Print analysis in detail. **16**
2. a) Explain Integration of Process Engineering with other departments. **16**
OR
b) Explain tolerance stacking and tolerance charts in detail. **16**
3. a) Explain Process layout, operations sequence for any given casting part. **18**
OR
b) Explain principal process, major process, auxiliary process in detail. **18**

SECTION – II

4. a) Explain parameters affecting surface finish of given job. **16**
OR
b) Explain Roundness, flatness of job. **16**
5. Explain OC curve and all related terminologies in detail. **16**
OR
Explain P-Chart and np chart. **16**
6. Write short notes on following : **18**
i) C-Chart ii) t-test iii) f-test.
OR
Explain correlation and regression analysis. **18**



[4063] – 5

T.E. Civil (Semester – I) Examination, 2011
CONSTRUCTION TECHNIQUES AND MACHINERY
(2003 Course)

Time : 3 Hours

Max. Marks : 100

- Instructions :** i) Answer **any 3** questions from **each** Section.
ii) Answers to **2** Sections should be written in **separate** books.
iii) Assume suitable data, **where** necessary.
iv) Figures to the **right** indicate **full** marks.

SECTION – I

1. a) Explain the growth in the construction sector and particularly in the infrastructure development in India, with help of examples. **10**
- b) Distinguish between labour oriented works and equipment oriented works with examples. Discuss drawbacks of both. **8**
2. Draw various connections in precast and prefabricated constructions w.r.t.
- i) Footing - column
- ii) Beam - column
- iii) Slab - beam. **16**
3. a) Compare scrapers with respect to all other earthmoving machineries. **10**
- b) Explain earthwork cycle with a flow diagram. **6**
4. Write short notes on : **16**
- i) Selection of construction equipment
- ii) Depreciation
- iii) Traveller crane
- iv) Siporex technology.

P.T.O.



SECTION – II

5. a) With sketches explain the details of an aggregate crushing plant. **10**
b) Explain any 2 methods of dewatering in detail. **8**
6. a) Explain slip-form construction with sketches. What are its advantages ? **(8+2)**
b) Explain tremie method of underwater concreting. **6**
7. a) Discuss advantages and various applications of pumped concrete. **8**
b) Explain construction of road using slip form pavers. **8**
8. Write short notes on : **16**
i) Economics of construction equipment
ii) Shotcreting
iii) Diaphragm wall construction
iv) Guniting and its applications.



**T.E. (Electrical) (Semester – I) Examination, 2011
MICROPROCESSOR AND ITS APPLICATIONS
(2003 Course)**

Time : 3 Hours

Max. Marks : 100

- Instructions :*
- 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) **Black** 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

1. Draw and explain Architecture of 8085 microprocessor. Explain the function of each block. 16

OR

1. a) Explain with the help of timing diagram following cycles : 8
- 1) Opcode fetch
 - 2) Memory read with wait state.
- b) Explain importance of status flags with various flags provided in 8085 with format of status flag register. 8
2. a) Write classification of instruction set of 8085 microprocessor and explain following instructions with examples : 8
- i) LDAX rp
 - ii) SHLD
 - iii) DAA
- b) Distinguish between memory mapped I/O and I/O mapped I/O scheme. 8

OR



2. a) Explain the various data transfer techniques. **8**
- b) Explain RIM and SIM instruction with function of each bit. **8**
3. a) Two array of Hexadecimal 8 bit numbers are stored with starting address C000 and B000. The length of array is 0DH. Write an assembly language program to add the hexadecimal number in two array's and store the result in third memory array whose starting address is E000. **9**
- b) Write an assembly language program to arrange the numbers stored in memory array in descending order. The starting address of the array is A000H and length of array is 0FH. **9**

OR

3. a) Explain the transmission formats and communication protocols needed for serial communication. **10**
- b) Draw an memory interface diagram to interface 10 KB ROM starting address 3000H and 4 K RAM starting address C000 to 8085 microprocessor with address decoding. **8**

SECTION – II

4. a) Write an assembly language program to first set PC7 bit and reset the same after delay on continuous basis. Assume delay subroutine is available. **6**
- b) Draw and explain functional block diagram of 8255. **10**

OR

4. a) Explain mode 2 and mode 3 of 8254 with timing diagram and application of mode 2 and mode 3. **6**
- b) Explain functional block diagram of 8279 display interface. **10**
5. a) With the help of flowchart write an assembly language program to control stepper motor interfaced with 8085. **8**
- b) Explain application of 8085 microprocessor for measurement of voltage, current and power with block diagram and flow chart. **8**

OR



5. a) Write an assembly language program to generate square wave with 33% duty cycle with the help of DAC interfaced to 8085 microprocessor. **8**
- b) Explain with the help of block diagram interfacing of ADC 0808/09 and write an assembly language program for A to D conversion. **8**
6. a) Explain the various flags provided in 8086 microprocessor with format of flag register. **6**
- b) Explain function of following pins of 8086 microprocessor :
- i) $\overline{\text{BHE}}/S7$ ii) $\overline{\text{DEM}}$ iii) $\overline{\text{MN}}/\overline{\text{MX}}$ **6**
- c) Explain the functions of
- i) Execution unit
- ii) Bus interface unit. **6**
- OR
6. a) Explain minimum and maximum mode of 8086 microprocessor. **10**
- b) Explain how memory segmentation is implemented in 8086 microprocessor with advantages of memory segmentation. **8**



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T.E. (Electrical) (Semester – I) Examination, 2011
ELECTRICAL MACHINES – II
(2003 Course)

Time : 3 Hours

Max. Marks : 100

- Instructions :** 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.

SECTION – I

1. a) Explain how a rotating magnetic field is produced when a three phase supply is connected across the 3-phase stator winding of an induction motor. **6**
- b) State the conditions under which a polyphase induction motor will have
- i) Rotor frequency = stator frequency
 - ii) Rotor emf frequency > stator supply frequency
 - iii) Rotor frequency < stator frequency
 - iv) Max. voltage and current in rotor
 - v) Min. voltage and current in rotor. **5**
- c) The induced emf between the slip-ring terminals of a three phase induction motor, when the rotor is at stand still is 100V. The rotor winding is star connected and has resistance and standstill reactance of 0.05Ω and 0.1Ω per phase respectively. Calculate the rotor current and phase difference between rotor voltage and rotor current at
- i) 4% slip and
 - ii) 100% slip **5**

OR

2. a) Derive the equation of torque for an induction motor. Draw the nature of torque-slip characteristic and show on the curve starting torque, maximum torque and slip at which torque is maximum. **8**

P.T.O.



- b) A 4-pole, 3-phase, 50 Hz, slip ring induction motor rotates at 1440 rpm with slip ring terminals. The rotor resistance is 0.1Ω /phase and stand still reactance /phase is 0.6Ω . If an external resistance of 0.1Ω /phase is added to rotor circuit, what will be the new full load speed. **8**
3. a) A 6-pole, 3-phase, 50Hz induction motor gives full load output of 20 H.P at 945 rpm. Stator losses amount to 1 kW. Allowing 13.65 Nm for mechanical torque lost in friction. Find :
- Rotor copper loss
 - Input to motor
 - efficiency. **8**
- b) Explain the tests to be carried out to determine the performance of an induction motor by circle diagram. **8**
- OR
4. a) Draw the equivalent circuit diagram for an induction motor. What is use of equivalent circuit ? **8**
- b) Explain the blocked rotor test for an induction motor. Which parameters can be determined from blocked rotor test ? **8**
5. a) What is need of starter for induction motor ? Explain the autotransformer starter used for induction motor. **6**
- b) Explain the construction of rotor of double cage motors. What are the advantages of double cage motor over single cage motor ? **6**
- c) A 3-phase, S.C.I.M. takes a starting current of 6 times the full load current, find the starting torque as a percentage of full load torque if the motor is started :
- D.O.L
 - Through a stardelt starter, the full load slip of motor is 4%. **6**
- OR
- 6 a) Explain why it is recommended to start big rating induction motor by reduced voltage method. **5**
- b) Explain the star-delta start method for an induction motor. **8**
- c) A S.C.I.M. has a full load slip of 0.05. The motor starting current at rated voltage is 6 items its full load current. Find the tapping on the autotransformer starter which should give full load torque at start. Also find the line current at starting. **5**



SECTION – II

7. a) Explain the effect of harmonic flux on the torque-speed characteristics of an induction motor. **8**
b) Explain the effect of injected voltage in rotor ckt of induction motor on speed and power factor of the induction motor. **8**

OR

8. a) Explain the V/f control method to control the speed of induction motor. **7**
b) What is an induction generator ? State the main points of difference between a synchronous generator and induction generator. Explain why induction generator has limited applications. **9**

9. a) Explain the cross-field theory related to single phase I.M. **8**
b) Explain the construction and working of a permanent split single value capacitor type single phase induction motor. Mention its applications. **8**

OR

10. a) Explain the principle of working of a shaded pole type single phase induction motor. State its applications. Is it possible to change the D.O.R. of a shaded pole motor. Explain your statement. **8**
b) Compare single phase motor with three phase induction motor. **8**

11. a) Explain the operation of d.c. series motor on a.c. supply. **6**
b) Explain the steps to draw the circle diagram for observing the performance of series motor. **6**
c) Explain the drawbacks of plain series motor. **6**

OR

12. a) Explain the speed-torque characteristics of d.c. series motor and a.c. series motor. What the effect of frequency on speed of a.c. series motor ? **6**
b) What is compoles ? What is roll of compoles in a.c. series motor ? **6**
c) Why compensation is provided in big rating series motors ? What are the methods of compensation ? Explain any one method of compensation. **6**



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T.E. (Electrical) (Semester – I) Examination, 2011
DESIGN OF ELECTRICAL MACHINES
(2003 Course)

Time : 3 Hours

Max. Marks : 100

- Instructions :** 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) **Black** figures to the **right** indicate **full** marks.
5) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam table is allowed.
6) Assume **suitable** data, if necessary and mention it clearly.

SECTION – I

1. a) With reference to design of 3-phase induction motor discuss following parts :
i) Magnetic circuit
ii) Electric circuit
iii) Dielectric circuit
iv) Thermal circuit
v) Mechanical parts. **10**
- b) Write a short note on : Electrical steel sheets. **6**
- OR
- 2 a) Discuss classification of insulating materials for electrical machinery and apparatus in relation to their thermal stability as per IS 1271 - 1958. **8**
- b) Explain the following terms :
i) Heating time constant. **2**
ii) Cooling time constant. **2**
iii) Various methods of cooling of transformer. **4**

P.T.O.



3. a) Draw a neat sketch of core type and shell type single phase transformer connection. Compare core type and shell type transformers on the basis of :
- i) Construction
 - ii) Leakage reactance
 - iii) Repairs
 - iv) Cooling. **10**
- b) Derive the output equation of 3-phase transformer. **6**

OR

4. a) Write the specifications of transformer as per IS 2026. **6**
- b) With reference to ranges of different types of windings used for transformer compare cylindrical, crossover, helical and continuous disc winding on the basis of
- i) Rating KVA
 - ii) Voltage kV
 - iii) Maximum current per conductor
 - iv) Conductor cross-section etc. **10**
5. a) Discuss various assumptions made for deriving relationship for leakage reactance of core type transformer. **6**
- b) With reference to mechanical forces developed under short circuit conditions :
- i) Draw neat sketches for leakage field, axial leakage field and radial leakage field.
 - ii) Discuss mechanical forces developed under short circuit conditions.
 - iii) Explain forces due to asymmetry.
 - iv) Discuss bracing of windings. **12**

OR

6. Write short notes on : **18**
- a) Design of tank with tubes for oil cooled transformers.
 - b) Forced oil circulation for large capacity transformers.
 - c) Regulation of transformer.



SECTION – II

7. a) Derive the output equation of 3-phase induction motor. 7
- b) Find the main dimensions and number of turns per phase for a 415 Volts, 50 Hz 11 KW, 1440 RPM, 3 phase induction motor using following data :
- | | |
|---------------------------|--------------------------|
| Specific magnetic loading | = 0.46 wb/m ² |
| Specific electric loading | = 30000 A/m |
| Full load efficiency | = 0.87 |
| Full load power factor | = 0.88 |
| Stator slots/pole/ph | = 3 |
- Winding used in full pitch winding and is having 60° phase spread. Also find the cross section of area of stator conductor choosing current density of 4.8A/mm². 9

OR

8. a) What is specific magnetic loading ? Discuss various factors taken into consideration while selecting it for three phase induction motor. 9
- b) Considering the good overall design, find the main dimensions of a 3 phase, 50 Hz, 10 kW, 415 Volts, 2900 RPM, 4 pole squirrel cage induction motor. Assume full load efficiency = 0.88, full load power factor = 0.9, specific magnetic loading = 0.47 wb/m² specific electric loading = 28000 A/m, winding factor = 0.955. 7
9. a) Discuss various factors considered in selection of length of air gap in 3-phase induction motor.
- b) Explain in detail harmonic induction torque and harmonic synchronous torque in 3-phase induction motor. 10

OR



10. a) Discuss in detail unbalance magnetic pull and its estimation. **8**
- b) Derive the equation for end ring current for the rotor of squirrel cage induction motor. **8**
11. a) Explain the method of calculation of magnetization current of in 3-phase induction motor. **10**
- b) What is magnetic saturation ? Discuss its effect on calculation of magnetizing current of induction motor. **8**
- OR**
12. a) A 3 phase, 55 kW, 3300 V, 50 Hz, 8 pole star connected induction motor has a magnetizing current which is 30% of full load current. Calculate number of stator winding turns per phase if the mmf required for flux density at 600 from the inter polar axis is 500 A. Assume winding factor = 0.95, full load efficiency = 0.94 and full load power factor = 0.86. **8**
- b) Explain the procedure to draw the circle diagram. **10**



[4063] – 55

T.E. (Electrical Engineering) (Semester – I) Examination, 2011
MANAGEMENT TECHNIQUES
(2003 Course)

Time: 3 Hours

Max. Marks: 100

- Instructions :** 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) **Black figures** to the **right** indicate **full** marks.
5) Assume suitable data, **if necessary**.

SECTION – I

Unit – I

1. Define management ? State the important functions of management ? Explain the conceptual difference between the terms Management, administration and organization. **16**

OR

2. a) Define the law of demand. State the exceptions to the law of demand. **6**
b) Explain the following with reference to the joint stock company : **10**
i) Formation of Joint Stock Company
ii) Characteristics of Joint Stock Company.

Unit – II

3. a) Explain the importance of plant location. Describe the various factors to be considered in selecting the actual site in a particular locality. **9**
b) Define plant layout. What are the different types of plant layout ? Explain the objectives of good plant layout. **9**

OR

P.T.O.



4. a) Define material handling. State the functions of material handling. **6**
- b) How will you classify the material handling devices ? Give one example of each type. **6**
- c) What is materials management ? Explain its objectives and importance. **6**

Unit – III

5. Describe in detail the main provisions of following acts : **16**
- i) Workmen compensation act ii) Minimum wages act

OR

6. a) What do you mean by human needs ? Explain the classification of hierarchy of needs as given by Maslow. **8**
- b) Write short notes on : **8**
- i) Labour relations
- ii) Handling of worker's grievances.

SECTION – II

Unit – IV

7. a) Define 'Financial Management'. Explain in brief the functions of financial management. **10**
- b) Describe the shares and debentures as sources of finance. **6**

OR

8. a) Differentiate between selling and marketing concept. Explain the role of 'marketing mix' in marketing management. **10**
- b) Differentiate between 'fixed capital' and 'working capital' with suitable examples. **6**



Unit – V

9. Describe in brief the concept of Entrepreneur and Entrepreneurship. Explain the need for promotion of Entrepreneurship and small business in India. **18**

OR

10. a) Define Total Quality Management. State the guiding principles of total quality management. **9**
- b) Define JIT production. Describe the elements of JIT in manufacturing. How is it different geom. JIT purchasing ? **9**

Unit – VI

11. a) Define Communication. Explain in brief the process of communication. **8**
- b) Explain the relative merits and demerits of verbal and non-verbal communication. **8**

OR

12. a) Explain the differences between business ethics and professional ethics. **8**
- b) What is 'Self development' ? Explain in brief different methods of self development. **8**



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T.E. (Electrical) (Semester – II) Examination, 2011
POWER SYSTEM – II
(2003 Course)

Time : 3 Hours

Total Marks : 100

- Instructions :**
- 1) Answer **any 3** questions from **each** Section (Unitwise).
 - 2) Answer **3** questions from Section **I** and **3** questions from Section **II** (Unitwise).
 - 3) Answers to the **two** Sections should be written in **separate** books.
 - 4) **Neat** diagrams must be drawn **wherever** necessary.
 - 5) **Black** 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

1. a) Explain the Ferranti effect of long transmission line in respect to
- i) Loci of V_s , V_r and V_i
 - ii) Causes
 - iii) Remedies. **8**

- b) A three phase, 50 Hz, transmission line is 400 km long

$$V_R = 220 \text{ KV}$$

$$r = 0.125 \text{ } \Omega/\text{km}$$

$$x = 0.4 \text{ } \Omega/\text{km}$$

$$y = 2.8 \times 10^{-6} \text{ } \text{S}/\text{km}.$$

Find the r.m.s. value and phase angle of the following :

- i) The incident and reflected voltages to neutral at receiving end
- ii) The incident and reflected voltages to neutral at 200 km from receiving end. **8**

OR

P.T.O.



2. a) What is surge impedance loading ? What are different methods to improve the surge impedance loading ? **8**
- b) A long transmission line delivers a load of 60 MVA at 124 KV, 50 Hz, at 0.8 p.f. lagging. Resistance of the line is 25.3Ω , reactance is 66.5Ω and admittance due to charging of capacitance is 0.442×10^{-3} mho. Find
- a) A, B, C, D constants
- b) Sending end voltage current and power factor. **8**
3. a) What do you understand by complex power ? Explain in detail. **8**
- b) How do you model a long transmission line on a paper for load flow or fault analysis purpose ? **8**
- OR
4. a) The short circuit of three phase generator was simulated in the laboratory by series R-L circuit connected through a switch (closed at $t = 0$) to a supply $80 \sin (100 \pi t + 20)$. Assume $R = 6 \Omega$, $L = 0.12$ H, and $\alpha = 20$. First current zero and maximum occurs at same time as that of zero and max. of s.c.current. Estimate :
- i) Time for first maximum current to occur.
- ii) α for maximum d.c. offset and zero d.c. offset current. **8**
- b) Explain in detail how symmetrical three phase short circuit fault analysis helps in selection of circuit breaker. **8**
5. a) Draw the zero sequence diagram of transformer giving reasons for different primary and secondary connection styles. **8**
- b) The voltages of three phase supply connected to a load of 20Ω resistance/phase and star connected, are $200 \angle 0^\circ$, $150 \angle 225^\circ$ and $210 \angle 130^\circ$.
- Estimate symmetrical components of
- i) phase voltage
- ii) line currents.
- Assume no neutral connection. **10**

OR



6. a) Derive the expressions for sequence reactances of transmission line. **8**
- b) 20 MVA, 6.6 KV, Y connected synchronous generator is working on no load and rated voltage. If $X'' = X_2 = 15\%$ and $X_0 = 5\%$.
Estimate :
- i) Resistance R_n to restrict SLG fault current to three phase S.C. fault current.
- ii) LLG fault current with R_n in neutral grounding circuit in positive sequence component form. **10**

SECTION – II

7. a) Give the classification of buses in power system for load flow study. Explain the necessity of such classification. **6**
- b) Explain the concepts of Z-bus and Y-bus matrices. **6**
- c) Give comparison between Gauss-Seidal and Newton-Raphson methods. **4**

OR

8. a) Discuss the importance and objectives of power flow study. **4**
- b) Formulate load flow equations for 'n' bus power system and classify various types of buses. **6**
- c) Explain the Newton-Raphson method for load flow study. **6**
9. a) Starting from the first principle, derive swing equation of synchronous machine. Define inertia constant. **6**
- b) Write short notes on :
- i) Dynamic stability **4**
- ii) Synchronizing power co-efficients. **6**

OR



10. a) Distinguish between steady state and transient stability. Discuss the methods used to improve transient stability of power system. **8**
- b) A 100 MVA, 11 KV, 50 Hz, four pole turbo generator has an inertia constant of 8 MJ/MVA.
- i) Find the stored energy in the rotor at synchronous speed.
- ii) If the mechanical input is suddenly raised to 80 MW for an electrical load of 50 MW, find rotor acceleration, neglecting mechanical and electrical losses.
- iii) If the acceleration calculated in part ii) is maintained for ten cycles, find the change in torque angle and rotor speed in revolutions per minute at the end of this period. **8**
11. a) With the help of neat diagrams, explain the different types of HVDC transmission system. **10**
- b) Write short note on – constant ignition angle control method. **8**
- OR
12. a) Discuss the advantages and limitations of HVDC transmission system. Also mention its applications. **10**
- b) Distinguish between HVAC and HVDC transmission system. **8**



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**T.E. (Electrical) (Semester – II) Examination, 2011
MICROCONTROLLER AND ITS APPLICATIONS
(2003 Course)**

Time : 3 Hours

Max. Marks : 100

- Instructions :**
- 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) **Black 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

1. a) Explain various criteria's while selection of micro controller for any application. **4**
- b) Explain with diagram architecture of 8051 micro controller with function of each block. **12**

OR

2. a) Explain in detail internal and external data and program memory structure of 8051 micro controller with pin \overline{EA} in case of program memory. **6**
- b) Describe various flags with format of status flag register of 8051 micro controller. **6**
- c) Write short note on SFR's of 8051 micro controller. **4**
3. a) Explain in detail mode 2 and mode 3 of timer in case of 8051 micro controller. **8**
- b) Explain the interrupt structure in detail of 8051 micro controller. **8**

OR

4. a) Explain importance of TI and RI flag in serial communication. **8**
- b) Explain stack operation with push and pop instructions. **6**
- c) What are the various addressing modes used in 8051 instructions ? **2**

P.T.O.



5. a) Explain external data moves and code memory read only data moves with instructions. **6**
- b) Write an assembly language program to multiply two 8 bit unsigned numbers stored at external data memory locations A 000 and A 001. Store Lower byte of result at D 000 and Higher byte result at D 001 locations of external data memory. **6**
- c) Explain range, relative range, absolute range and long range in detail. **6**

OR

- 6 a) Write an assembly language program to add 10 h numbers stored in internal RAM from 30h location onwards store lower byte of result at 70h location and higher byte result at 71 H location of internal data memory. **6**
- b) Write an assembly language program to read and test P₁ and check whether it has a value of 17 H, if yes send 44 H to P₂. **6**
- c) The number B7 h is stored somewhere in external RAM location between 0100h and 0200h. Write an assembly language program to find address of that location and store that address in R5 (lower byte) and R6 (higher byte). **6**

SECTION – II

7. a) Write a short notes on emulator, simulator, assembler and compiler of 8051 micro controller. **8**
- b) Explain 8051 communication with computer through RS 232 link. **8**

OR

8. a) Explain salient features of members of mcs-51 family. **8**
- b) Explain steps to receive data serially in 8051 microcontroller and importance of RI flag. **8**
9. a) With the help of interfacing diagram explain stepper motor control with the help of 8051 microcontroller. Write an assembly language program to rotate the stepper motor in any direction. **10**
- b) With the help of interfacing diagram explain temperature measurement with the help of 8051 microcontroller. Write an assembly language program to read temperature and store it in internal RAM location 70h. **8**



OR

10. Write a short notes on :

- i) Pressure measurement using 8051
- ii) D.C. motor speed control using 8051
- iii) Flow measurement using 8051. **18**

11. a) Explain Architecture of 8096. **10**

b) Explain function of watch dog timer in 8096. **6**

OR

12. a) Explain features of 8096 microcontroller family. **8**

b) Explain pwm output generation using 8096. **8**



[4063] – 58

T.E. Electrical (Semester – II) Examination, 2011
POWER ELECTRONICS
(2003 Course)

Time: 3 Hours

Max. Marks: 100

- Instructions :** 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) **Black** figures to the **right** indicate **full** marks.
5) **Use** of logarithmic tables, slide rule, Mollier charts, electronics pocket calculator and steam tables is **allowed**.
6) Assume suitable data, **if necessary**.

SECTION – I

1. a) Explain complementary commutation of SCR with necessary circuit and wave forms. **8**
b) Describe UJT triggering method for SCR. Why pulse triggering is preferred over other methods. **8**

OR

2. a) Explain four modes of operation of TRAC. In which quadrants the device is suitable for operation ? why ? **8**
b) Explain the following SCR protection circuits with neat diagram. **8**
i) $\frac{dv}{dt}$ ii) $\frac{di}{dt}$ iii) Short circuit iv) Surge voltage.

3. a) Draw and explain in detail switching characteristics of IGBT. **5**
b) Compare MOSFET and IGBT. **5**
c) With the help of equivalent circuit of MCT, explain turn on and turn off process in detail. Also state merits of MCT. **6**

OR

P.T.O.



4. a) Explain following terms associated with MOSFET :
- | | | |
|------------------------|--------------------------|---|
| i) Pinch off voltage | ii) Transconduction | |
| iii) Threshold voltage | iv) Turn on and Turn off | 8 |
- b) What are gate requirements of MOSFET and IGBT. 8
5. a) Depending on what factors, does the load current become discontinuous ? Explain the operation of 3 ϕ three pulse converter with discontinuous load current. 10
- b) What is meant by phase angle control technique ? Explain it briefly for a 1 ϕ half controlled circuit with R load. 8

OR

6. a) A single phase full converter without free wheeling diode is supplied through a transformer and the load is RL. If one of the thyristor gets shorted, what will be its effect on the output ? Draw and explain the operation with necessary waveforms. Also show the devices conducting in each mode. 8
- b) Explain operation of single phase dual converter in circulating current mode. Compare circulating current mode and non circulating current mode of a dual converter. 10

SECTION – II

7. a) How choppers are classified based on their quadrant operations ? Explain two quadrant chopper to give forward motoring and forward braking operations of a dc motor. 8
- b) What is a step up chopper ? Draw output voltage and current waveforms and derive output voltage expression. 8

OR



8. a) Explain CLC and TRC control in chopper. Compare FM and PWM techniques. **8**
- b) A step down chopper is feeding RL load with $R = 1\ \Omega$ and $L = 5\ \text{mH}$ from input of 220V, at 500 Hz and 30% duty.
Calculate mini. and maxi. load current and % ripple current. **8**
9. a) Explain working of a three phase bridge inverter feeding resistive star connected load with 180° mode of conduction.
Draw relevant waveforms for control signals and phase voltages. **10**
- b) Explain why :
- i) Transistorised inverters are preferred over thyristorised inverter.
 - ii) Diodes are connected in antiparallel across switching devices in inverter circuits feeding inductive loads. **8**

OR

10. a) What is a parallel inverter ? Explain with neat diagram and waveforms.
What are applications of this circuit ? **8**
- b) How multiple pulse width signal is generated to operate an inverter circuit ?
How harmonics control is achieved ? **10**
11. a) What is a Snubber ? How snubber elements are calculated for SCR ? What is the effect on switching power loss ? **8**
- b) What are the voltage and frequency control techniques used in inverters ?
What is external and internal control ? **8**

OR

12. a) What are typical protection elements used in a power electronic circuit ?
Explain importance of Max. temp., PIV and I^2t ratings for selection of device ? **8**
- b) What is VSI and CSI ? Compare. What are advantages of CSI ? **8**



**T.E. (Electrical) (Semester – II) Examination, 2011
ELECTRICAL MACHINES – III
(2003 Course)**

Time : 3 Hours

Max. Marks : 100

- Instructions :** 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) **Black figures** to the **right** indicate **full** marks.
5) **Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam table is allowed.**
6) Assume **suitable** data, if necessary.

SECTION – I

1. a) Define winding factors and derive expression for distribution factor for the armature winding of ac generator. **8**
b) An 8-pole, 3-phase, 60° phase spread, double layer winding has 72 coils in 72 slots. The coils are short pitched by two slots. Calculate the winding factor for the fundamental and third harmonic. **8**

OR

2. a) Define voltage regulation for an alternator. What are the reasons for the variation in the terminal voltage of a loaded alternator ? Why voltage regulation on leading p.f. load is negative ? **8**
b) The tests on a 15 MVA, 11 KV, 3-phase, 50 Hz star-connected alternator gave the following results :

Field of T per pole, thousands :	10	18	25	30	40	45
Open circuit line emf, KV :	5.0	8.4	10.0	11.2	12.8	13.65
Full load current, ZPF test :	–	0	–	–	–	10.0
Line pd KV						

Find the armature reaction armature -turns, the leakage reactance and regulation for full load at 0.8 p.f. lagging. Neglect armature resistance. **8**

P.T.O.



3. a) Explain two reaction theory for salient-pole ac generator for resistive load.
Write from vector diagram the equation for excitation emf for resistive load. **8**
- b) A 3 MVA, 6-pole, alternator runs at 1000 rpm on 3.3 KV bus bars. The syn. reactance is 25%. Calculate the synchronizing power and torque per mechanical degree of displacement when the alternator is supplying full load at 0.8 p.f. lag. **8**

OR

4. a) The single phase alternators operating in parallel have induced emfs on open circuit of $230 \angle 0^\circ$ and $230 \angle 10^\circ$ volts and respective reactances of $j2\Omega$ and $j3\Omega$. Calculate :
- Terminal voltage,
 - Current,
 - Power delivered by each of the alternators to the load of impedance 6Ω (resistive). **8**
- b) Derive an expression for power-angle for a salient pole alternator. Draw $\rho - \delta$ curve from equation. When power delivered by the alternator to the load will be maximum ? **8**
5. a) Compare the 3-phase synchronous motor with 3-phase induction motor. **4**
- b) Explain in detail the operation of synchronous motor at constant load and variable excitation. **6**
- c) A 3-phase, 400 V, star connected synchronous motor drives a constant load and takes a line current of 30 A having effective armature resistance and synchronous reactance per phase of 0.2Ω and 2Ω respectively. Find the power factor at which the motor will operate when the field current is adjusted to give the line values of generated emf as 500 V to 300 V. **8**

OR



6. a) List and explain the various torques associated with operation of synchronous motor. **4**
- b) Explain the role of damper winding in salient pole synchronous machines. **6**
- c) A star connected synchronous motor rated at 187 KVA, 3-phase, 2300 V, 47 Amp, 50 Hz, 187.5 rpm has an effective resistance of 1.5Ω and synchronous reactance of 20Ω per phase. Determine the internal power developed by the motor when it is operating at rated current and 0.8 p.f. leading. **8**

SECTION – II

7. a) Explain for reluctance motor
- i) Construction and principle of working
 - ii) Sketch and explain torque -speed characteristics.
 - iii) Advantages, and
 - iv) Limitations. **8**
- b) Draw and explain the stepper motor characteristics. Also write various applications of stepper motor. **8**

OR

8. a) What are the similarities between brushless d.c. motor and a conventional dc motor ? Give advantages of brushless dc motor over conventional dc motor. **8**
- b) For linear induction motor, derive an expression for linear force developed in terms of specific loadings and linear dimensions. **8**
9. a) Explain the harmonic synchronous torque developed in three phase induction motor. What is effect of same on the performance of induction motor ? **8**
- b) A 3-phase, 12-pole, 50 Hz, star connected alternator has 180 slots with 5 conductors per slot. The fundamental component of total flux per pole is 0.02 Wb. The airgap flux contains 10% of third harmonic flux and 4% tooth harmonic flux. Calculate per phase and the line emfs for full pitch coils. **8**

OR



10. a) What are the causes of harmonics in synchronous machines. How do harmonics affect the performance of synchronous machine ? **8**
- b) What is slot harmonics ? Explain the methods to reduces slot harmonics in induction motors. **8**
11. a) Explain the Kron's primitive machine. How are the various windings of a machine represented by the primitive machine ? **8**
- b) Using generalized machine model for salient pole synchronous machine, derive expression for power in terms of load angle, reactances and voltages. **10**

OR

12. a) Using primitive machine model of induction motor, derive an expression for electromagnetic torque developed in induction motor. **10**
- b) Explain the various limitations of generalized theory of electrical machines. **8**



[4063] – 6

T.E. (Civil) (Semester – II) Examination, 2011
ADVANCED SURVEYING
(2003 Course)

Time : 3 Hours

Max. Marks : 100

- Instructions :** 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

1. a) State the objectives of Geodetic triangulation. Classify the systems of triangulation and explain any one system with specifications and sketch. **8**
b) State methods of baseline measurement and explain any two in detail. **10**
OR
2. a) Explain the procedure of establishing mean sea level. **8**
b) How will test the inter-visibility in geodetic surveying ? Explain the two methods. **10**
3. a) Correct the observed altitude for the height of signal, curvature and refraction from the following data : **8**
Observed altitude = + 2° 48' 39"
Height of instrument = 1.120 m
Height of signal = 4.870 m
Horizontal distant = 5.112 km
Coefficient of refraction = 0.07
(Take $R \sin 1'' = 30.88 \text{ m}$).
b) Explain various signals used in geodetic surveying with neat sketches. **8**
OR

P.T.O.



4. a) State the types of tape corrections to be applied to the measured length of base line and explain any two in detail. 8

- b) The following are the observed values of an angle :

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

Find :

- i) Probable error of single observation
- ii) Probable error of weighted arithmetic mean
- iii) Probable error of single observation of weight 3. 8

5. a) Explain step by step procedure for figure adjustment of geodetic quadrilateral without central station also explain what is spherical excess. 8

- b) Explain method of differences for triangulation adjustments. 8

OR

6. a) Explain reciprocal levelling and derive the equation for difference in elevation between two stations in geodetic trigonometric levelling. 8

- b) Write a note on correction for curvature and refraction in geodetic surveying. 8

SECTION – II

7. a) Describe with sketches the field work of survey with photo theodolite. Explain how you would plot the survey. 8

- b) A tower, lying on a flat area having an average elevation of 800 m above msl, was photographed with a camera having a focal length of 24 cm. The distance between the images of top and bottom of the tower measures 0.34 cm on the photograph. A line AB, 200 m long on the ground, measures 12.2 cm on the same photograph. Determine the height of the tower if the distance of the image of the top of the tower is 8.92 cm, from the principal point. 10

OR



8. a) Write short notes on :
- i) Crab and drift
 - ii) Flight planning
- and define principal point and photo nadir. 10
- b) Write a note on Radial line method of plotting. 8
9. a) What is raster and vector data ? How do you analyse the satellite image for civil engineering projects, draw sketches to support your answer ? 8
- b) State and explain various components of GPS. Differentiate between absolute positioning and relative positioning. 8
- OR
10. a) What is GIS ? State various GIS software's and explain how remote sensing and GIS are linked. 8
- b) What is the working principle of total station ? How will you use total station to determine the remote distance (RDM) ? 8
11. a) What is hydrographical surveying ? How do you carry out hydrographical surveying to determine the cross section of a river ? 8
- b) What is sounding ? State various equipments used for measuring sounding and explain any one with a neat sketch. 8
- OR
12. a) State various methods of locating the position of boat in hydrographical surveying and explain any two methods briefly. 8
- b) What is fathometer ? Explain its use in assessing the amount of silt deposition in the water body. 8



[4063] – 60

T.E. (Electrical) (Semester – II) Examination, 2011
ELECTRICAL INSTALLATION MAINTENANCE AND TESTING
(2003 Course)

Time : 3 Hours

Max. Marks : 100

- Instructions :** 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) **Black** figures to the **right** indicate **full** marks.
5) **Use** of logarithmic tables, electronic pocket calculator is **allowed**.
6) Assume **suitable** data, **if** necessary.

SECTION – I

UNIT-I

1. a) Compare 3 phase 3 wire overhead system with 3 phase 4 wire overhead system for volume of conductor material required. Clearly state the assumptions made. **10**
b) State type of supply systems and draw the single line diagram of a typical AC power supply system. **6**

OR

2. a) A 300 m long distributor is fed at point 'A' and is loaded as 60 A at 0.85 lag p.f. and 85 A at 0.9 lag p.f. at point 'B' and Point 'C' respectively. Point 'B' is midpoint of feeder. Power factors at both load points are referred to the voltage at point 'C'. The impedance of each section is $0.2 + j0.3$. Calculate the sending end voltage, current and power factor if the voltage at point 'C' is maintained at 230 V. **10**
b) State Kelvins law and Kelvins modified law and discuss its limitations. **6**

UNIT-II

3. a) Draw duplicate busbar system used in substation. List various equipments used in it. **8**
b) Explain in detail procedure of design of earthing grid of a substation. **8**

P.T.O.



OR

- 4. a) Explain in detail classification of substations. **8**
- b) Explain the terms :
 - i) Touch potential
 - ii) Step potential
 - iii) Transfer Potential. **8**

UNIT-III

- 5. a) State various maintenance strategies. Explain them in detail. **10**
- b) Define following terms and explain their significance : **8**
 - i) Dielectric absorption ratio
 - ii) Polarization index.

OR

- 6. a) Explain in detail various insulation stressing factors. **10**
- b) Explain the concept of condition monitoring and state its advantages. **8**

SECTION – II

UNIT-IV

- 7. a) Explain transformer oil contamination process. Explain the filtration of transformer oil with block diagram. **10**
- b) What is dissolved gas analysis ? Explain its importance in condition monitoring of transformers. **8**

OR

- 8. a) Discuss in detail different failure modes of transformer. **10**
- b) Explain degree of polymerization and its use in condition monitoring. **8**

UNIT-V

- 9. a) Explain in detail various causes of failure of power cables. **8**
- b) What are the various abnormal operating conditions in induction motor and their causes ? **8**

OR



10. a) Write detail note on thermography and its use in condition monitoring. **8**
b) What is Signature Analysis ? Explain its use in condition monitoring of electrical equipments. **8**

UNIT-VI

11. a) Explain the nomenclature of the bearings. Draw the relevant figures. **8**
b) What are different failures modes of bearing ? **8**

OR

12. a) Write note on spark pulse measurement. **8**
b) Explain vibration signature analysis used for failure analysis of rotating machines. **8**



[4063] – 61

T.E. (E and TC / Electronics, Incl. Elex.) (Semester – I) Examination, 2011
(2003 Course)

DIGITAL DESIGN AND COMPUTER ORGANIZATION

Time : 3 Hours

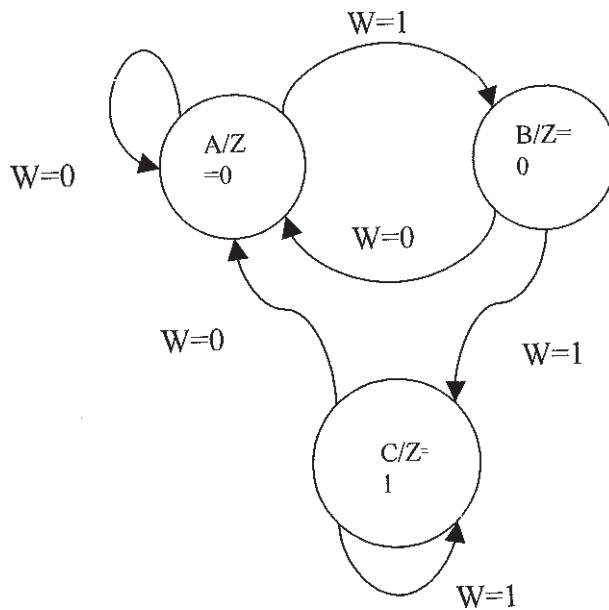
Max. Marks : 100

- Instructions :**
- 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 **whenever** necessary.
 - 4) Assume **suitable** data, if necessary.
 - 5) Figures to the **right** indicate marks.

SECTION – I

1. a) Draw an ASM chart for FSM given in fig.

8



b) Design sequential circuit to detect an overlapping sequence – 1101–
(Use JK F/F).

8

OR

2. a) Write VHDL code for JK flip flop using state diagram.

8

b) Give hazard free realization for the following Boolean function.

8

$$F(A, B, C, D) = \sum m (0, 2, 6, 7, 8, 10, 12).$$

P.T.O.



3. a) What are the different types of VHDL modeling ? Explain with example. **10**
 b) Write a VHDL code for 4 bit ripple counter. **6**

OR

4. a) Explain synthesis and simulation. **6**
 b) What is the use of library and use clause ? **4**
 c) Explain following with respect to VHDL with example.
 i) Entity ii) Process iii) Architecture **6**
5. a) Draw and explain Von Neumann Architecture. **8**
 b) Explain different truncation methods with suitable example. **6**
 c) Perform $(13) \times (-6)$ using bit pair recording of multiplier. **4**

OR

6. a) Perform non-restoring division for the following
 Divident = 1011
 Divisor = 0101 **8**
 b) Represent 571.25 in IEEE-754 single and double precision formats. **4**
 c) Explain the Booth's algorithm used for signed number multiplication. **6**

SECTION – II

7. a) What is Queue ? How queue is useful in parameter passing ? **8**
 b) Draw and explain single bus organization of the CPU. **8**

OR

8. a) Describe the following addressing modes with suitable examples. **8**
 i) Register mode
 ii) Immediate mode
 iii) Memory addressing mode
 iv) Direct addressing mode
- b) Explain the following : **8**
 i) Branching ii) Conditional codes



[4063] – 62

**T.E. (Semester – I) (E & TC/ Electronics, Incl. Elex.) Examination, 2011
ANALOG INTEGRATED CIRCUITS – DESIGN AND APPLICATIONS
(2003 Course)**

Time : 3 Hours

Max. Marks : 100

- Instructions :**
- 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) **Black** 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.
 - 7) **Q. 1** or **Q. 2**, **Q. 3** or **Q. 4**, **Q. 5** or **Q. 6** (for Section I).
Q. 7 or **Q. 8**, **Q. 9** or **Q. 10**, **Q. 11** or **Q. 12** (for Section II).

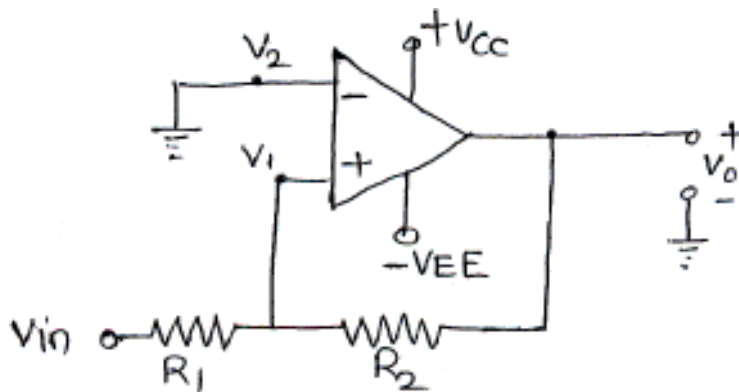
SECTION – I

1. a) State and explain four significance of any four op-amp parameter. **8**
b) For op-amp having slew rate $2V/\mu\text{sec}$, what is the maximum close loop voltage that can be used when the input signal varies by 0.5 V in $10\mu\text{sec}$. **8**
OR
2. a) Draw and explain with neat circuit diagram of widlar current source. **8**
b) Derive the slew rate equation for an op-amp. **8**
3. a) Explain the necessity of linearization of signal. Explain any one method of linearization in details. **8**
b) With the help of neat circuit diagram and frequency response, explain how the practical integrator overcomes the limitations of an ideal integrator. **8**
OR
4. a) Explain advantages of active guard drive in an instrumentation amplifier. **8**
b) Design a circuit to convert a 4mA to 20mA input current to a 0V to 5V output voltage. The reference direction to the input source is from ground into your circuit and the circuit is powered from $\pm 15V$ regulated supplies. **8**

P.T.O.



5. a) State important characteristics of a comparator, and explain with neat circuit diagram and waveform peak detector. **10**
- b) For the non-inverting Schmitt Trigger shown in fig., calculate the component values for getting a hysteresis width of 6V. Assume the saturation voltage to be $\pm 12V$. **8**



OR

6. a) Explain working of full wave precision rectifier with suitable waveform. **8**
- b) Discuss the need of sample and hold circuit. Draw and explain the sample and hold circuit. **10**

SECTION – II

7. a) Draw and Explain the operation of asymmetrical a triangular wave generator using op-amp. **8**
- b) Design a wein bridge oscillator to have an output frequency of 100Hz to 10kHz in two ranges. Give the selection criteria of op-amp. **8**

OR

8. a) Draw the circuit diagram of an astable multivibrator for 50% duty cycle output using IC555 and explain its operation. **8**
- b) In the VCO, calculate the change in output frequency, if the supply voltage is varied between 9V to 11V. Assume $V_{CC} = 12V$, $R_T = 6.8k\Omega$, $C_T = 75Pf$, $R_1 = 15 k\Omega$ and $R_2 = 100k\Omega$. **8**



9. a) Explain briefly different filter alignment. **8**
b) Design a wide band reject filter having $f_H = 100\text{Hz}$ and $f_L = 2\text{kHz}$. **8**

OR

10. a) For a second order low pass filter, calculate the cut off frequency and passband voltage gain if the component values are $R_1 = 12\text{k}\Omega$, $R_F = 7\text{k}\Omega$, $R_1 = R_2 = 33\text{k}\Omega$, $C_1 = C_2 = 0.002\ \mu\text{f}$. **8**

- b) Compare active and passive filter. Draw and explain all pass filter with neat circuit diagram and frequency response. **8**

11. a) Draw circuit diagram of antilog amplifier using op-amp and derive the expression for output voltage. Explain its one application in details. **10**

- b) Explain multiplier circuit for **8**

- a) Obtain square root
b) Obtain RMS voltage.

OR

12. a) Explain 'Capture range' and 'Lock range' in detail with waveform. Calculate the output frequency ' f_o '. Lockrange ' Δf_L ', capture range ' Δf_C ' for 1C565, If $R_T = 10\text{k}\Omega$, $C_T = 0.01\ \mu\text{f}$, $C_F = 10\ \mu\text{f}$, $R_{12} = 3.6\text{k}\Omega$. **10**

- b) Explain by block diagram the difference between an analog and digital PLL and explain how PLL can be used for AM demodulator. **8**



[4063] – 63

T.E.E and TC/Electronics, Incl. Elex. (Sem. I) Examination, 2011
DIGITAL COMMUNICATION
(2003 Course)

Time : 3 Hours

Max. Marks : 100

- Instructions :**
- 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) **Black** 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

1. a) Consider a pair of stationary process $X(t)$ and $Y(t)$. Show that the cross-correlations $R_{xy}(z)$ and $R_{yx}(z)$ of these processes have the following properties :
 - i) $R_{xy}(z) = R_{yx}(z)$
 - ii) $|R_{xy}(z)| \leq \frac{1}{2} [R_x(0) + R_y(0)]$, where $R_x(z)$ and $R_y(z)$ are the auto correlation functions of $X(t)$ and $Y(t)$ respectively. **8**

- b) Define the following with examples :
 - i) Random process
 - ii) Stationary process
 - iii) Ergodic Process
 - iv) Auto correlation and cross-correlation
 - v) Gaussian Process. **10**

OR

P.T.O.



2. a) A signal $m(t) = \cos 200\pi + 2 \cos 320\pi$ is ideally sampled at $f_s = 300$ Hz. If the sampled signal is passed through an ideal LPF with a cutoff frequency of 250 Hz, what frequency components will appear in the O/P. Draw their spectrum. **8**
- b) State and prove Sampling Theorem for band limited signal. What is the difference between ideal, natural and flat top sampling. Explain Aperture effect. **10**
3. a) Compare DM, ADM, PCM, LPC and DPCM with respect to following :
- Bit rate
 - Bandwidth
 - Signal to Noise Ratio
 - Hardware Complexity
 - Advantages.
- 8**
- b) Consider a $\mu = 255$ compander to be used with a $V = 3$ bit quantizer where the output varies over 18.75 V. For an input of 0.6 V. What is the quantization error with and without companding ? **8**

OR

4. a) Discuss the need for companding of speech signals. **8**
- b) A linear delta modulator is designed to operate on speech signals limited to 3.4 KHz. The modulator sampling rate is ten times the Nyquist rate and step size $S = 100$ mV. It is tested with 1 KHz sinusoidal signal. Determine the maximum amplitude of this test signal to avoid slope overload. **8**
5. a) Enlist the desirable properties of line codes. For the given sequence 10010011 give the line coded output for RZ, NRZ, AM1 and Manchester Code. Compare their power spectral densities. **8**
- b) Differentiate between bit synchronization and frame synchronization. Explain one method for bit synchronization in detail. **8**

OR

6. a) With the help of Block diagram explain the AT6T multiplexing system. Calculate bit rates at the output of all the stages. **8**
- b) With the help of a suitable sequence and shift registers explain scrambling. How scrambled signal can be recovered ? **8**



SECTION – II

7. a) Describe with the help of Block Diagram of transmitter and Receiver explain 16-pt QAM system. With the help of mathematical expression explain its working and BW requirement. **10**
- b) Give the difference between offset-QPSK and non-offset QPSK. **4**
- c) Draw the waveform for the given bit stream 00100110011110 at the O/P of DPSK encoder. **4**

OR

8. a) With the help of graphical representation explain phase continuity in MSK. What is minimum in MSK ? **8**
- b) Compare BPSK and BFSK with the help of equations and signal space representation. **6**
- c) Write a short note on GMSK. **4**
9. a) Derive the expression for the probability of error of integrate and dump filter. **8**
- b) Binary data is transmitted using PSK at a rate of 1 Mbps over an RF link having bandwidth of 3 MHz. Find the signal power required at the receiver input to maintain the error probability less than or equal to 10^{-6} . Assume noise power spectral density at the input to be 10^{-10} W/Hz. Also given $\frac{1}{2} \operatorname{erfc}(3.3) = 10^{-6}$. **8**

OR

10. a) Explain the terms. Optimum filter, matched filter and correlator. **8**
- b) QPSK signal is detected by matched filter. Derive the expression for its error probability. **8**



11. a) What are the properties of maximum length sequences ? Give the graphical representation of auto correlation property of random data and of a PN sequence. Comment on the two graphs. **8**

b) A spread spectrum system has the following parameters :

Information bit duration $T_b = 4.095 \text{ ms}$

PN chip duration $T_c = 1 \text{ } \mu\text{s}$.

Find processing gain. If the ratio $\frac{E_b}{N_o} = 10$, what is the Jamming margin ? What is the number of shift registers required ? **8**

OR

12. a) Give the difference between

i) Slow FHSS and Fast FHSS

ii) TDMA and CDMA. **8**

b) For a FHSS system with binary FSK, two hops/symbol and a PN generator with outputs as [010, 110, 101, 100, 000, 101, 011, 001] for input bits [0, 1, 1, 0]. Plot the output-frequencies for the input message [show relative frequencies]. **8**



**T.E. (E & TC/Electronics, Indl. Elex) (Semester – I) Examination, 2011
MICROPROCESSOR, MICROCONTROLLER AND APPLICATIONS
(2003 Course)**

Time : 3 Hours

Max. Marks : 100

- Instructions :** 1) Attempt Q. 1 & Q. 2, Q. 3 & Q. 4, Q. 5 & Q. 6 in Section – I.
2) Attempt Q. 7 & Q. 8, Q. 9 & Q. 10, Q. 11 & Q. 12 in Section – II.
3) Assume *suitable* data, if necessary.

SECTION – I

1. a) Explain with suitable diagram architecture of 8051. 8
b) List and explain hardware tools used for debugging of microprocessor based systems. 8
- OR
2. a) Compare microprocessor and microcontroller. 4
b) State difference between Von – Neumann & Harward Architecture. 4
c) List and explain software tools used for debugging of microprocessor based system. 8
3. a) Explain with example addressing modes of 8051. 7
b) Explain the following instructions of 8051 : 9
i) MOVC A, @ A + PC
ii) MOVX A, @ DPTR
iii) CJNE @ R1, # Data, Rel
- OR
4. a) Explain following SFRs : 8
i) TCON
ii) IE
b) Explain the organization of Internal Ram of 8051. 4
c) State and explain various modes of timer of 8051. 4
5. a) Write an ALP for finding largest number of given numbers. 6
b) Write an ALP for addition of two 16 bit numbers. 6
c) Explain SMOD SFR. 6

OR



- 6. a) Write an ALP for finding factorial of a given number. **6**
- b) Write an ALP to evaluate following expressing $Y = AB + C$. **6**
- c) Explain interrupt structure of 8051. **6**

SECTION – II

- 7. a) With suitable interfacing diagram write ALP for generating staircase waveform using 8051. **8**
- b) Write program for displaying 'MICROCONTROLLER' on 2nd line of LCD in 4-bit mode. **8**

OR

- 8. a) Interface LM 35 to 8051 with suitable ADC to store temperature data in internal RAM starting from 40H address and store only 16 readings. Write ALP for this application. **8**
- b) Move stepper motor 10 steps in clockwise and 10 steps in Anticlockwise direction and then stop the motor. **8**
- 9. a) Draw RS 232 interface for 8051 to PC using DB 9 connector. **6**
- b) State specifications of RS 485 interface. **4**
- c) Compare RS 232 with I2C interface. **6**

OR

- 10. a) Draw interfacing diagram for 8051 with any I2C device. State sequence of operation for transferring data between I2C device and 8051. **8**
- b) Explain interface pins for SPI interface. Compare I2C & SPI interface. **8**
- 11. a) State features of 89 v 51 RD2 controller. **6**
- b) State memory organization of PIC microcontroller. **6**
- c) Explain peripherals supported by PIC micro controllers. **6**

OR

- 12. a) With suitable block diagram explain architecture of AVR microcontrollers. **6**
- b) State and explain types of memories supported by AVR microcontrollers. **6**
- c) State and explain number of peripherals supported by AVR microcontrollers. **6**



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**T.E. (E. and TC/Electronics, Indl.Elex)(Semester – I) Examination, 2011
MECHATRONICS
(2003 Course)**

Time : 3 Hours

Max. Marks : 100

- Instructions :**
- 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) Black figures to the **right** indicate **full** marks.
 - 5) **Use** of electronic pocket calculator is **allowed**.
 - 6) Assume **suitable** data, **if** necessary.

SECTION – I

1. a) Define Mechatronics and state primary disciplines involved in it with an explanation for measurement system with its constituents. Draw block diagram of the system also. **8**
- b) Elucidate following :
 - 1) Accuracy
 - 2) Precision
 - 3) Resolution
 - 4) Drift**8**

OR

2. a) Explain the role of Electronics in Mechatronics. **8**
- b) Laser printer is a Mechatronics System, explain this statement with appropriate block schematic. **8**
3. a) Explain any four temperature measuring devices. **8**
- b) The sensitivity of RTD is 0.039 ohms per degree C. The resistance at 0°C is 100 ohms. Find the resistance at 30°C, 50°C and 100°C. Design a Wheatstone bridge circuit to accommodate this RTD and find out an output voltage proportional to above temperatures take excitation voltage of 12 V. **8**

OR

P.T.O.



4. a) Compare incremental shaft encoder and absolute shaft encoder. **8**
- b) An LVDT having range of operation of ± 60 mm has a primary voltage of 10V rms the secondaries are identical to primary presume full transfer of voltage from primary to secondary without loss. Find the output voltage for displacement of + 20 mm, + 40 mm, – 20 mm and – 40 mm. **8**
5. a) Explain weighted register and R – 2R type DAC. **6**
- b) Enlist different features of 89 C series micro controller. **6**
- c) Compare the features of AD 522 and AD 524. **6**

OR

6. a) Give the applications of PIC 16 F 84. **4**
- b) Explain features of any suitable PIC micro controller. **4**
- c) Draw and explain PLC architecture in brief. Explain operating cycle of the same. **10**

SECTION – II

7. a) Enlist different types of display recorders. Explain working of instrumentation tape recorder. **8**
- b) Explain RS 232 standard. **8**

OR

8. a) Explain 4 channel data acquisition system employing 8 bit ADC with neat block diagram. **8**
- b) Explain I²C bus with timing diagram. **8**
9. a) Give classification of actuators. Explain working of each type with example. **9**
- b) Explain selection criteria for stepper motor. **9**

OR



10. a) Explain following valves with suitable sketches :
- 1) Sliding spool valve
 - 2) Rotary spool valve
 - 3) Poppet valve **9**
- b) Explain following cable construction.
- 1) Co-axial cables. **4**
 - 2) Fibre-optic cables. **5**
11. Design a weighting system using strain gauges for 40 tons of vehicles with appropriate block diagram, ckt diagram and display. **16**
- OR**
12. Discuss pick and place Robot, with actuator and sensors. Give reasons for selection of these components. **16**
-



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T.E. (E & TC/Electronics. Incl. Elex.) (Semester – II) Examination, 2011
DIGITAL SIGNAL PROCESSING
(2003 Course)

Time: 3 Hours

Max. Marks: 100

- Instructions :** 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** books.
4) **Neat** diagrams must be drawn **wherever** necessary.
5) **Black figures** to the **right** indicate **full** marks.
6) Assume suitable data, **if necessary**.

SECTION – I

1. a) A Causal LTI discrete time system is described by the difference equation.
 $y(n) = 0.2 y(n - 1) + 0.08 y(n - 2) + 2x(n)$ where $x(n)$ and $y(n)$ are respectively input and output sequences of the system. Determine
- a) Transfer function
 - b) Impulse response
 - c) Step response
 - d) Magnitude and phase response 10
- b) Define the following properties of 2-transform
- i) Time reversal
 - ii) Differentiation in 2-domain
 - iii) Convolution
 - iv) Final value theorem 8

OR

P.T.O.



2. a) The transfer function of Causal LTI system is $H(z) = \frac{1 - 2^{-1}}{1 + \frac{3}{4}z^{-1}}$. Find the following :
- Impulse response
 - Output of the system to the input $x(n) = \left(\frac{1}{3}\right)^n u(n) + u(-n-1)$
 - Stability of the system. **10**
- b) Determine the ROC of the sequence $y(n) = 2^n u(-n-1)$. **4**
- c) Discuss the advantages and disadvantages of digital processing of signals. **4**
3. Draw the signal flow graph of 16-point DFT using Radix -2 DIF-FFT and DIT-FFT algorithms. Comment on the number of twiddle factor computations required in each stage and computational complexity. **16**

OR

4. Perform the linear convolution of finite duration sequences $h(n)=(3,2)$ and $x(n) = (1, +2, - 1, 3, 2, -3, -2, -1)$ by overlap save and add method. Verify the result by direct convolution. **16**
5. a) What are the desirable characteristics of windows ? **6**
- b) Design an ideal LPF with the frequency response.

$$H_d(e^{j\omega}) = 1, \quad \pi/4 \leq |\omega| \leq \pi$$

$$0, \quad 0 \leq |\omega| < \pi/4$$

Find the values of $h(n)$ for $N = 11$ using

- Hamming window
- Hanning window.

10

OR



6. a) Explain in detail about the frequency sampling method of designing FIR filters. **8**
- b) A LPF is designed with the following desired frequency response.

$$H_d(e^{j\omega}) = \begin{cases} e^{-j2\omega}, & -\pi/4 \leq |\omega| \leq \pi/4 \\ 0 & \text{otherwise} \end{cases}$$

Determine the filter coefficients $h_d(n)$ if the window function is defined as

$$\omega(n) = \begin{cases} 1 & \text{for } 0 \leq n \leq 4 \\ 0 & \text{otherwise} \end{cases}$$

Also determine the frequency response $H(e^{j\omega})$ of the designed filter. **8**

SECTION – II

7. Design and realize a digital filter using BLT for the following specifications. **18**
- i) Monotonic passband and stop band.
 - ii) -3.01dB cut off at 0.5π rad.
 - iii) Magnitude down atleast 15 dB at $\omega = 0.75 \pi$ rad.

OR

8. a) Explain the method of approximation of derivatives for the design of IIR filters. **8**
- b) A system has an impulse response given by

$$h(n) = (0.8)^n u(n) + n(0.4)^n u(n)$$

Obtain the cascade and parallel realization of the system. **10**



- 9. a) Show that decimation is a frequency stitching process. 8
- b) Explain the application of multi rate signal processing in sub-band coding of speech signals. 8

OR

- 10. a) Develop an expression for the output $y(n)$ as a function of input $x(n)$ for the multirate structure as shown in fig.1. 8

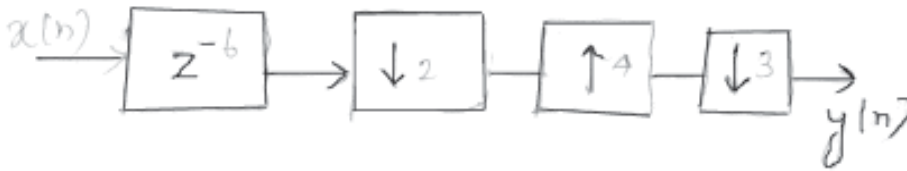


fig. 1.

- b) Draw the block diagram of multistage decimator and interpolator and explain the advantages and disadvantages of multirate DSP. 8
- 11. a) Compare fixed point and floating point arithmetic. 4
- b) Explain the relationship between truncation error and bits ‘b’ for representing a decimal to binary. 6
- c) What is the effect of quantization on pole locations ? 6

OR

- 12. a) What are limit cycle oscillations ? 4
- b) Consider the transfer function :

$$H(z) = \frac{1}{1 - 0.94z^{-1} + 0.64z^{-2}}$$

Find the pole location and effect due to rounding to 3 bit (excluding sign bit). 8

- c) Explain deadband of the system with an example. 4



[4063] – 7

T.E. Civil (Semester – II) Examination, 2011
PROJECT MANAGEMENT AND COMPUTER APPLICATIONS
(2003 Course)

Time : 3 Hours

Max. Marks : 100

- Instructions:** 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) **Black** 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

1. A project has the following time schedule

16

Activity (i-j)	Duration (in days)
1-2	10
1-3	12
2-5	08
2-7	12
3-4	06
3-6	05
4-5	08
5-6	08
5-7	10
6-7	06
7-8	12

P.T.O.



- a) Draw AOA network and calculate the total project duration. Show critical path.
- b) Calculate EST, EFT, LST, LFT, Total float and Free float for the activities.

OR

2. a) Differentiate between A.O.A. and A.O.N. 4
- b) State the advantages and disadvantages of a Gantt chart. 4
- c) The time estimates for three activities A, B and C are as follows : 8

	Optimistic Time	Most likely Time	Pessimistic Time
A	10	12	14
B	6	8	12
C	5	10	12

Determine expected time and variance for each activity. Which activity has more reliable time estimates ?

3. Following table pertains to a project work, indirect cost of which is Rs. 500/- per week.

Activity	Normal		Crash	
	Duration (weeks)	Cost in Rs.	Duration (weeks)	Cost Rs.
1-2	7	6,000	5	6,500
2-3	9	10,000	5	11,000
2-4	8	5,500	4	6,000
3-6	10	6,500	7	8,000
4-6	4	7,000	3	7,500
6-7	0	–	0	–
6-8	2	4,000	2	4,000
7-8	5	8,000	3	9,000



- a) Draw network and show critical path. 4
- b) Calculate normal project duration and cost of the project. 2+2
- c) Calculate optimum duration and optimum cost of the project by stage by stage compression. 8

OR

4. Manpower requirement for various activities of a project are as follows

Activity	Duration (Days)	No. of Masons
1-2	7	12
2-3	7	06
2-4	8	12
2-5	7	8
3-5	12	8
4-5	8	4
5-6	9	4

- a) Draw a network and calculate project duration Highlight critical path. 4
 - b) Draw ESI squared Network. Calculate EFR and IFR. 8
 - c) Draw Histogram for ESI network. 4
5. a) Define a contract. Give a list of documents included in a contract. 6
- b) What is 'Arbitration' ? Discuss the role of an arbitrator in a civil engineering contract. 6
 - c) Write in details about the functions of the Materials Manager. 6

OR

6. a) What is Economic Order Quantity ? Explain in detail. 4
- b) 'ABC Analysis is for selective control'. Explain with suitable example. 4
 - c) State and explain any four functions of a Project Manager on a construction site. 4
 - d) Write short notes on : 6
 - i) Fixed and variable cost
 - ii) Objectives of material management.



SECTION – II

7. a) Draw the site layout for a multi storeyed building. **6**
 b) What are the causes and types of accidents ? **6**
 c) How will you ensure quality control in a construction project ? **6**
- OR
8. a) Enlist various PPE used on a building construction site. Prepare a safety programme for a construction firm. **9**
 b) What are the various factors to be considered while selecting a good site layout for Dam construction. **9**
9. a) Prepare a flow chart and write the algorithm for Simpson's $\frac{3^{\text{th}}}{8}$ rule. **8**
 b) Draw flow chart and write algorithm for Lagrangian interpolation method. **8**
- OR
10. a) Use Newton Raphson method to find smallest positive root of the equation $\tan x = x$, correct to three decimal places. **8**
 b) Using Gauss Quadrature method, Evaluate $\int_0^{\pi} x \sin x \, dx$. **8**
11. Write short notes on : **16**
 a) Various softwares used in Civil Engineering.
 b) Daily Reports.
 c) Use of Excel as spreadsheet.
 d) Quality control.
- OR
12. a) What are the steps followed to write an algorithm ? **4**
 b) Give the different symbols used in a flow chart. **4**
 c) Explain the importance of Data Base Management. **4**
 d) Draw a typical format of Daily Progress Report. **4**



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**T.E. (E & TC/Electronics, Incl. Elex.) (Semester – II) Examination, 2011
INFORMATION THEORY AND CODING TECHNIQUES
(2003 Course)**

Time : 3 Hours

Max. Marks : 100

- Instructions :** 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) **Black figures** to the **right** indicate **full** marks.
5) **Assume** suitable data, if necessary.

SECTION – I

1. a) Consider a DMS with source probabilities {0.35, 0.25, 0.20, 0.15, 0.05}. Determine the Huffman code for this source, calculate the average code word length and efficiency of the code. **8**
- b) State and explain all Shannon's theorems related to information theory. **8**

OR

2. a) Draw channel diagram and determine the probabilities associated with equiprobable inputs. Also find mutual information if the channel matrix is given by **8**

$$\begin{bmatrix} 0.9 & 0.1 \\ 0.2 & 0.8 \end{bmatrix}$$

- b) Determine the Lempel Ziv code for the following bit stream. **8**
0 1 0 0 1 1 0 0 1 1 1 1 1 0 1 1 0 0 0 0 0 1 0 0 1 1
Recover the original sequence from the encoded stream.
3. a) A black and white T.V. picture frame consists of 2×10^6 pixels with 32 equilikely brightness level and frame transmission rate of 32 frames per second. **8**
- i) calculate average information rate for the above signal.
ii) calculate the minimum bandwidth require to transmit the television signal on AWGN channel with SNR of 40 dB.

P.T.O.



- b) Show that the Shannon's limit for an AWGN channel is equal to -1.6 dB in information capacity theorem. **8**

OR

4. a) Explain the rate distortion theory and sphere packing problem. **8**

- b) Write a short notes on :

- i) Water filling interpretation of information capacity theorem.
ii) Data compression. **8**

5. a) Generate a $(7, 4)$ systematic cyclic code. Write all codewords using generator matrix. Design decoding using parity check matrix, if the following code words are received find corrected code word. **10**

- i) 1100111
ii) 1011000.

- b) Write short notes on : **8**

- i) Error probability after coding
ii) Perfect codes.

OR

6. a) Draw an encoder for an $(7, 4)$ cyclic code for generator polynomial $x^3 + x^2 + 1$. Find out the code words for message words show all the steps **8**

- i) 1010
ii) 1110.

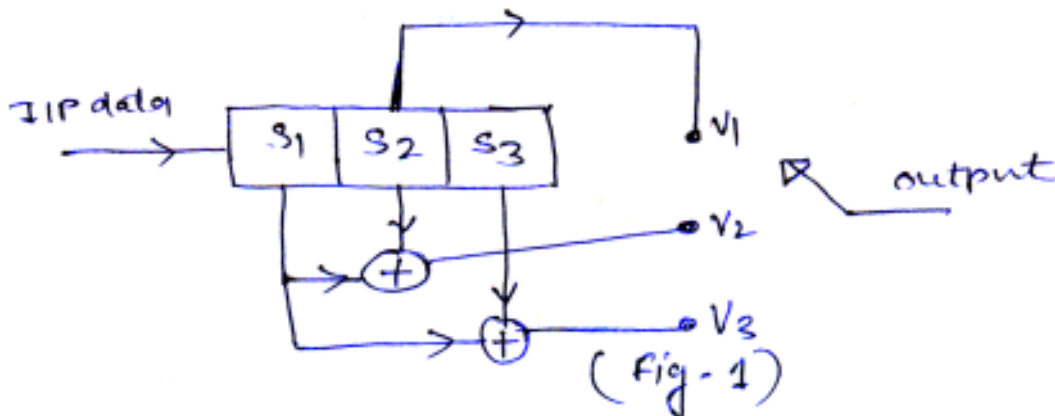
- b) Write short notes on : **10**

- i) Burst error correction
ii) Fire codes
iii) Golay codes.



SECTION – II

7. a) For the convolutional encoder shown in fig. 1 determine the constraint length. Construct the code tree, state diagram, Trellis diagram. Find out the output of the encoder corresponding to the message sequence 10111 using Trellis. **12**



- b) What are turbo codes and explain the coding and decoding procedure of turbo codes ? **6**

OR

8. a) Explain in detail about Viterbi algorithm with an example. Show all details steps for decoding. **12**

- b) Compare the performance of binary symmetric channel and binary AWGN channel with respect to asymptotic coding gain. **6**

9. a) Find the generator polynomial for BCH code over GF (16) using primitive polynomial $g(x) = x^4 + x + 1$ over GF(4) code word. The code should correct 2,3 errors. **8**

- b) Explain JPEG compression standards and its applications. **8**

OR



10. a) What are data encryption standards ? Discuss in brief about symmetric and asymmetric cryptography. **8**
- b) Discuss in detail about RSA algorithm. Encode the word 'CODE' using the key generated by two primes 5 and 11. **8**
11. a) Explain in detail with analysis satellite link power budget. **8**
- b) Explain the following terms related to mobile communication. **8**
- i) Frequency reuse
 - ii) Hand-off.
- OR
12. a) Draw and explain the block diagram of space diversity technique. Enlist the different types of diversity techniques. **8**
- b) Write a short notes on : **8**
- i) CDMA
 - ii) SDMA.



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T.E. (Instrumentation and Control) (Semester – I) Examination, 2011
MICROCONTROLLER TECHNIQUES
(2003 Course)

Time : 3 Hours

Max. Marks : 100

- Instructions :**
- 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) **Black 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

1. a) Explain the I/O port expansion in 8051. **8**
b) What are the different addressing modes in 8051 ? Give examples of each. **10**
OR
2. a) Draw and explain the internal structure of port pins of Port 0 and Port 1 of 8051. **8**
b) Write a program to generate an up counter in register R7, going through all the stages from 1Ch to D5h to D5h continuously.
Eg. 1Ch, 1Dh, 1Eh,D4h, D5h, 1Ch, 1Dh...D4h, D5h, 1Ch... **10**
3. a) Write a program to complement port pin P2.1 every time the external interrupt 1 occurs. Explain all the SFRs configures for the same. **8**
b) Explain the different modes of timers in 8051 with neat diagram. **8**
OR
4. Write a program to measure unknown frequency using 8051. **6**
Also draw the flowchart for the same. **4**
With neat diagram explain the connections done to measure frequency. **2**
Explain all the SFRs used in the program and their configuration bits. **4**
5. Write short notes (**any two**) : **16**
 - a) Interfacing of thumbwheel switch to 8051
 - b) 16 X 4LCD interfacing to 8051
 - c) 8 bit DAC interfacing to 8051.

P.T.O.



SECTION – II

6. a) Draw a schematic to interface a serial 8 bit ADC to the 8051. Explain the necessary waveforms of ADC studied, as essential part of the interfacing. **8**
- b) With a neat diagram explain the interfacing of stepper motor with the 8051. Also explain what is half step and full step sequence in stepper motors. **8**
- OR
7. a) Explain the interfacing of serial EPROM to 8051 with respect to following :
- i) Block diagram. **3**
 - ii) Timing diagram. **3**
 - iii) Description. **2**
- b) Write a program to drive a stepper motor continuously, in clockwise direction for 5 rotations and anti clockwise direction for 5 times consecutively. Assume full step sequence. **8**
8. a) With a neat diagram explain the data memory map of 16C61. **8**
- b) Explain the following instructions of PIC. **8**
- i) BTFSC f, b
 - ii) CALL k
 - iii) MOVWF f
 - iv) COMF f, d
- OR
9. a) Ten 8 bit numbers are stored from address 30h in the data memory of PIC 16F877. Write a program to add these numbers and store the result at 40h and 41h. **8**
- b) What is a watch dog timer ? Explain its role in the working of PIC microcontrollers. **8**
10. Write short notes (**any three**) : **18**
- a) Interrupt structure of PIC 16C61
 - b) Compare mode of CCP module
 - c) SPI mode of MSSP module
 - d) USART Asynchronous Transmitter.



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T.E. Instrumentation and Control (Semester – I) Examination, 2011
SIGNALS AND SYSTEMS (2003 Course)

Time : 3 Hours

Max. Marks : 100

- Instructions: 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**.

SECTION – I

1. a) Determine if the following systems described by

i) $y(t) = \sin[x(t + 2)]$

ii) $y(n) = x(2 - n)$,

are memory less, causal, linear, time invariant and stable.

10

b) Determine the response of the system whose input $x(n)$ and the unit sample response $h(n)$ is given as,

8

$$x(n) = \frac{1}{3}n; 0 \leq n \leq 6$$

= 0; elsewhere

$$h(n) = 1; -2 \leq n \leq 2$$

OR

2. a) Determine the natural response of the system described by the differential

equation, $10 \frac{dy(t)}{dt} + 2y(t) = x(t)$, with $y(0) = 2$

8

b) Determine the natural response (zero input response) for the following system,

$$y(n) - \frac{1}{4}y(n-1) - \frac{1}{8}y(n-2) = x(n) + x(n-1), \text{ with } y(-1) = 0; y(-2) = 1$$

10

P.T.O.



3. a) Calculate the Laplace transform of the following : 8

i) $x(t) = e^{-at} \cdot u(t)$

ii) $x(t) = -e^{-at} \cdot u(-t)$.

b) Determine the initial value $x(0^+)$ and the final value $x(\infty)$ given by the following Laplace transform $X(s)$, 8

i) $X(s) = \frac{1}{s^2 + 5s - 2}$

ii) $X(s) = \frac{s + 2}{s^3 + 2s^2 + s}$.

OR

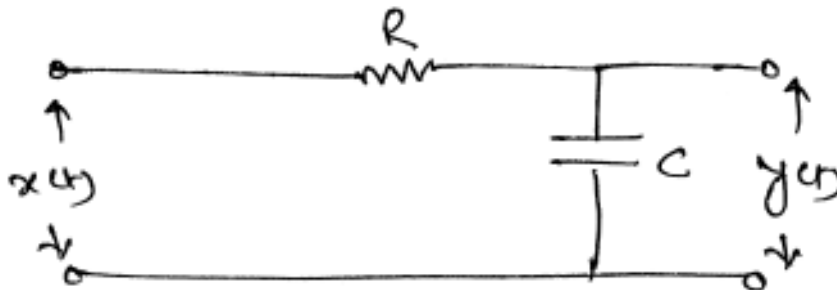
4. a) The input output relation of a system at initial rest is given by,

$$\frac{d^2 y(t)}{dt^2} + 4 \frac{dy(t)}{dt} + 3y(t) = \frac{dx(t)}{dt} + 2x(t),$$

Find the system transfer function, frequency response and impulse response. 8

b) For the RC filter shown in the fig, 8

- i) Obtain impulse response
- ii) Obtain step response
- iii) Determine stability.



5. a) Find inverse Fourier transform of the following signals, 8

i) $X(j\omega) = \frac{6j\omega + 16}{(j\omega)^2 + 5j\omega + 6}$

ii) $X(j\omega) = \frac{j\omega + 3}{(j\omega + 1)^2}$.



b) The differential equation of the system is given as, 8

$$\frac{d^2y(t)}{dt^2} + 5\frac{dy(t)}{dt} + 6y(t) = -\frac{dx(t)}{dt},$$

Determine the frequency response and the impulse response of the system.

OR

6. a) Give the limitations of the Fourier transform. 8

b) State and prove the properties of the Fourier transform. 8

SECTION – II

7. a) Define and explain : 8

i) Energy spectral density function.

ii) Cross correlation and Auto correlation.

b) Find the auto correlation of the following signals, 8

i) $x(n) = \{4, \underset{\uparrow}{3}, 2, 1\}$

ii) $x(n) = u(n)$.

OR

8. a) Find the cross correlation of the following discrete time signals, 8

$$x(n) = \{\underset{\uparrow}{1}, 2, 3, 4\}$$

$$h(n) = \{\underset{\uparrow}{3}, 2, 1, 0\}$$

b) Compute the auto correlation of the following signal using the graphical method $x(n) = \{\underset{\uparrow}{2}, 3, 1, 4\}$. 8

9. a) Define random variables and differentiate between discrete and continuous random variables. 8

b) State the properties of cumulative distribution function. 8

OR



10. a) Define PDF and explain the properties of PDF. **8**
- b) Define the following : **8**
- i) Mean
 - ii) Variance
 - iii) Standard Deviation
 - iv) Mean square.
11. a) Explain in detail : **10**
- i) Time division multiplexing
 - ii) Frequency division multiplexing.
- b) Write short note on Frequency Modulation Techniques. **8**
- OR
12. a) Differentiate between Narrow Band Frequency Modulation and Wide Band Frequency Modulation. **9**
- b) Give various applications of Modulation techniques. Explain any one in detail. **9**



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T.E. (Semester – I) (Instrumentation and Control) Examination, 2011
ANALYTICAL INSTRUMENTATION
(2003 Course)

Time : 3 Hours

Max. Marks : 100

- Instructions :**
- 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) Black figures to the **right** indicate **full** marks.
 - 5) Assume suitable data, if **necessary**.

SECTION – I

1. a) What are the Advantages and Disadvantages of Instrumental methods over Classical methods ? **8**
- b) Compare Qualitative and Quantitative analysis with suitable examples. **8**
- OR
2. a) Explain principle and instrumentation used for coulometry. **8**
- b) Explain principle and instrumentation used for voltametry. **8**
3. a) State and derive Beer-Lambert's law and also discuss deviation of Beer-Lambert's law. **18**
- OR
4. a) With a neat diagram, explain working and principle of Atomic Absorption Spectrophotometer. **10**
- b) Compare the following :
 - 1) Photo-colorimeter and Spectrophotometer
 - 2) Null balance Photo-colorimeter and Direct reading Photo-colorimeter. **8**

P.T.O.



5. a) Explain AC arc type excitation in Atomic Emission Spectroscopy. 8

b) With a neat diagram, explain working and principle of flame photometer. 8

OR

6. a) Enlist various IR sources and explain any one of them in detail. 8

b) What are the advantages of FTIR spectrophotometer over dispersive IR spectrophotometer ? 8

SECTION – II

7. a) Explain construction and working of NMR Spectrometer. 8

b) Explain Raman Effect. Why Laser is needed as a source in Raman spectrophotometer ? 8

OR

8. a) Explain O₂ Gas Analyzer in detail. 8

b) Differentiate Fluorescence and Phosphorescence. 8

9. a) Explain working of Gas Chromatography and give ideal characteristics of carrier gas. 10

b) Explain the block diagram of Mass Spectrometry and discuss importance of vacuum in Mass Spectrometer. 8

OR

10. a) With the help of neat diagram explain HPLC and also discuss pumps used in HPLC. 10

b) Enlist various Mass Spectrometer detectors and explain Faraday's cup. 8

11. a) Enlist various radiation detectors and explain GM counter. 8

b) Explain Auger Emission Spectroscopy and required Instrumentation. 8

OR

12. a) State and prove Bragg's law of diffraction. 8

b) Explain Scintillation counter. 8



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T.E. (Semester – I) (Instrumentation and Control) Examination, 2011
ELECTRONIC INSTRUMENTATION
(2003 Course)

Time : 3 Hours

Max. Marks : 100

- Instructions :**
- 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) **Black 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

1. a) Explain True R.M.S. meter with neat schematic diagram. 8
b) Explain Automatic Test Equipment with block diagram. Give its advantages and limitations. 10
OR
2. a) Explain principle of Q meter with practical Q meter circuit. 8
b) With the help of neat block diagram explain working of Digital Multimeter (DMM). 10
3. a) Explain pulse generator with neat block diagram. 8
b) Short note on sampled sine wave synthesizer. 8
OR
4. a) Give four differences betⁿ function generator and frequency synthesizer. 8
b) Explain any four pulse characteristics with neat diagram. 8

P.T.O.



5. a) Give four differences between Dual trace and Dual beam oscilloscope. **8**
- b) Explain following modes in Digital storage oscilloscope
- | | | |
|-------------------|-------------------|----------|
| i) Pretrigger | ii) Roll Mode | |
| iii) Post trigger | iv) Refresh Mode. | 8 |

OR

6. a) Explain following terms in Cathode Ray Oscilloscope
- | | | |
|------------------|--------------------------|-----------|
| i) Delayed sweep | ii) Vertical sensitivity | |
| iii) Delay line | iv) 10 : 1 probe. | 12 |
- b) Give four differences between Analog storage oscilloscope and Digital storage oscilloscope. **4**

SECTION – II

7. a) Explain role of sample and hold circuit and Analog Multiplexer in case of ADC. **8**
- b) Explain flash type of ADC with neat diagram. Give its advantages and disadvantages. **10**
- OR
8. a) Write short note on (**any 3**) : **18**
- | | |
|---|--|
| i) Data logger | |
| ii) Voltage to frequency convertor | |
| iii) Successive Approximation type ADC | |
| iv) Resolution and Quantization errors in ADC | |
| v) Specification of DAC (any 3). | |

9. a) Explain significance of $3\frac{3}{4}$, $3\frac{7}{4}$, $3\frac{1}{2}$ digit display in Multimeter. **6**
- b) Short note on Autoranging, Autopolarity and Autozeroing techniques used in DMM. **10**

OR



10. a) Write short note on Digital capacitance meter. **8**
- b) Explain universal counter with neat block diagram. **8**
11. a) Write short note on **any 2** : **16**
- i) Time Division Multiplexing
 - ii) Virtual Instrumentation
 - iii) Pulse code Modulation.
- OR
12. a) Explain logic analyzer with neat block diagram. **8**
- b) Write short note on Distortion Meter. **8**



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T.E. (Instrumentation and Control) (Semester – II) Examination, 2011
DIGITAL SIGNAL PROCESSING
(2003 Course)

Time : 3 Hours

Max. Marks : 100

Instructions : 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) Black 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

1. a) Determine $H(e^{j\omega})$ from $H(z)$ for the system.

$$8y(n) - 6y(n-1) + y(n-2) = 8x(n).$$

Determine the magnitude and phase response.

8

b) Find the impulse response of cascade system, if

$$h_1(n) = (-1/2)^n u(n)$$

$$h_2(n) = (1/2)^n u(n).$$

Also find the response of $x(n) = (1/4)^n u(n)$.

8

OR

P.T.O.



2. a) Given the system function

$$H(z) = 1 - 2z^{-1} + \frac{1}{2}z^{-2} + \frac{1}{2}z^{-3} + \frac{1}{2}z^{-4}.$$

Obtain a cascade realization.

8

b) Find the 'z' Transform of

1) $x_1(n) = e^{-(n/40)}u(n)$

2) $x_2(n) = e^{-(n/40)}\sin(2\pi n/8)u(n).$

8

3. a) Prove that DIT FFT requires less computation than conventional DFT if the length of sequence is large.

4

b) Determine 8 point DFT of the sequence, where $x(n) = 2^n$ using the in place radix-2 decimation-in-time and radix-2 decimation-in-frequency algorithms. Follow exactly the corresponding signal flow graphs and keep track of all the intermediate quantities by putting them on the diagram.

12

OR

4. a) Determine the 8 point DFT of the sequence $x(n) = \left\{ \frac{1}{2}, \frac{1}{2}, \frac{1}{2}, \frac{1}{2}, 1, 1, 1, 1 \right\}$

using in place radix-2 decimation-in-time and radix-2 decimation-in-frequency algorithms. Follow exactly the corresponding signal flow graphs and keep track of all the intermediate quantities by putting them on the diagram.

12

b) State and prove the symmetry properties of DFT.

4

5. a) What are FIR filter characteristics ? Explain frequency sampling techniques of FIR filter design.

8

b) Design a FIR digital filter to approximate an ideal LPF with pass-band gain of unity, cut-off frequency of 850 Hz and working at a sampling frequency of $f_s = 5000$ Hz. The length of impulse response is 5. Use Rectangular and Bartlett window.

10

OR



6. For the desired response

$$H_d(e^{j\omega}) = \begin{cases} e^{-j3\omega}, & \omega_{c1} \leq |\omega| \leq \omega_{c2} \\ 0, & |\omega| < \omega_{c1}, \omega_{c2} < |\omega| \leq \pi \end{cases}$$

Determine $H(e^{j\omega})$ for $M = 7$ for $\omega_{c1} = \frac{\pi}{4}, \omega_{c2} = \frac{\pi}{2}$ using **18**

- a) Rectangular window
- b) Bartlett window
- c) Hamming window
- d) Hanning window.

SECTION – II

- 7. a) Explain impulse invariance technique. What is its drawback and how bilinear transformation overcomes it ? Explain concept of frequency pre-warping. **6**
- b) Design a low pass Butterworth filter with the sampling rate of 10 kHz with the flat response to 3 dB in the pass band 0 to 1 kHz and at least 12 dB down for frequencies above 3 kHz. Use bilinear transformation to convert into digital filter. **12**

OR

- 8. a) Differentiate between analog and digital filters. **6**
- b) Design digital Chebyshev type I filter which satisfy the following specifications

$$\frac{1}{\sqrt{2}} \leq |H(e^{j\omega})| \leq 1 \dots \text{for } \dots 0 \leq \omega \leq 0.2\pi$$

$$\dots \dots \dots |H(e^{j\omega})| \leq 0.2 \dots \dots \text{for } \dots 0.6\pi \leq \omega \leq \pi$$

Use the bilinear transformations. **12**



9. a) Explain in brief how dynamic range scaling is useful to avoid undesirable amplitude oscillations. **6**
- b) Write short note on Round off error in FFT algorithm. **6**
- c) Draw the architecture of DSP processor. **4**

OR

10. a) Draw and explain in detail the architecture of DSP processor. **8**
- b) Explain fixed point and floating point data format in DSP processor. **4**
- c) Explain the indirect addressing modes in TMS320C6X. **4**
11. a) Illustrate the syntax of the assembly code for following :
- i) Add
 - ii) Subtract
 - iii) Multiply
 - iv) Load
 - v) Store. **10**
- b) Justify the necessity of MAC and Barrel shifter in DSP processor. **6**

OR

12. a) Write a short note on Limit cycles in IIR digital filter. **6**
- b) Illustrate the syntax of the assembly code for following :
- i) Add
 - ii) Subtract
 - iii) Multiply
 - iv) Load
 - v) Store. **10**



**T.E. (Instrumentation & Control) (Semester – II) Examination, 2011
PROCESS LOOP COMPONENTS (2003 Course)**

Time : 3 Hours

. Marks : 100

- Instructions :** 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) Black 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

1. a) Draw generalized process loop diagram and explain each components. **6**
b) Explain in detail following terms : **8**
 i) Process variable
 ii) Manipulated variable
 iii) Controlled variable
 iv) Set point.
c) Explain why current signal is used over voltage signal for transmission purpose. **4**

OR

2. a) What is need of signal conditioning circuit ? Explain with example. **6**
b) Draw and explain block diagram of 2 wire and 4 wire transmitter. **8**
c) List any 2 components in field area and control room area. **4**

P.T.O.



3. a) With the help of a neat sketch explain the working of I to P converter. **6**
- b) Write the important specification for Differential Pressure Cell. **6**
- c) Explain zero elevation and zero suppression for level measurement using DPT. **4**

OR

4. a) Compare SMART transmitter with conventional transmitter (4 points). **6**
- b) What are various desired features of the transmitter ? **6**
- c) Compare two wire and four wire transmitters. **4**
5. a) Draw and explain front panel of Digital Controller. Give the advantages of digital controller over analog controller. **8**
- b) Explain the following terms related to various control actions. **8**
- 1) Offset
 - 2) Neutral zone
 - 3) Reset action
 - 4) Rate gain.

OR

6. a) Explain ON-OFF action in detail. Also explain its 2 application. **8**
- b) What is mean by tuning of controller. List various methods of controller tuning. Explain any one method. **8**

SECTION – II

7. a) List 8 selection criteria for PLC in detail. **8**
- b) Explain architecture of PLC and give its 2 application. **10**

OR



8. a) Draw and explain :
- i) Rung
 - ii) Ladder diagram
 - iii) Scan time. (3×2)
- b) Compare Relay logic and PLC logic. 6
- c) Explain interface of PLC to Pneumatic system. 6
9. a) An equal % valve has maximum flow of $60 \text{ m}^3/\text{s}$ and minimum flow $2 \text{ m}^3/\text{s}$. Find the flow rate at 25% opening if the total travel is 10 cm. 8
- b) List 4 types of control valves and explain any one control valve in detail. 8
- OR
10. a) What are the various considerations for selecting a control valve with reference to application and with reference to characteristics. 8
- b) Explain use of valve actuator and positioner. 8
11. a) Draw block diagram and explain square root extractor. 8
- b) Explain standard ISA sequence (4 sequence) for Alarm Annunciator. 8
- OR
12. a) Explain significance of square root extractor with reference to Differential Pressure Transmitter. 4
- b) Explain :
- i) Flow totalizer
 - ii) Damper
 - iii) High/low selector. (4×3)
-



[4063] – 8

T.E. (Semester – II)(Civil) Examination, 2011
STRUCTURAL DESIGN – II
(2003 Course)

Time : 4 Hours

Max. Marks : 100

- Instructions :**
- 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) Answers 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

1. a) Explain how limit state method is superior to ultimate load theory and working stress method also explain limitations of LSM. 9

- b) Calculate moment of resistance by working stress method for the section described as follows Width = 230 mm, Overall depth = 430 mm, flange thickness = 110 mm, effective flange width = 1450 mm, 5 No. 20 mm dia on tension side, Clear cover to the reinforcement = 35 mm, Material 20 and Fe 415. 8

- c) Write short note on effect torsion on beams. 4

- d) What is the difference between partial safety factor and factor of safety ? 4

OR

P.T.O.



2. a) Explain in brief : 9
- i) Characteristic stress
 - ii) Over reinforced section
 - iii) Longitudinal reinforcement in column.
- b) Calculate moment of resistance by limit state method for the beam section detailed as follows effective simply supported span = 5.6 m width of beam = 230 mm, overall depth of beam = 530 mm, 4 No. 25 mm dia on tension side and 3 No. 12 mm. dia on compression side. Clear cover = 35 mm, on both sides, Material M 20, Fe 500. 8
- c) Calculate working udl excluding its self weight by limit state method for the beam detailed as follows clear simply supported span = 5 m, width of support = 300 mm width of beam = 300 mm, overall depth of beam = 500 mm, 4 No. 16 mm dia on tension side clear cover = 35 mm, Material M 20 , Fe 415. 8
3. Design continuous beam IJK for flexure only as shown in Fig. 1 by limit state method with 15% redistribution of moment. Wall of 230 mm thk on both the spans, height of wall on both beams is 3 m, slab thk is 125 mm for S1 and S2 and 130 mm for S3. Live and floor finish load on all slabs are 5 kN /sqm and 1 kN/sqm respectively. Use M20 and Fe 500. Sketch the reinforcement details. 25

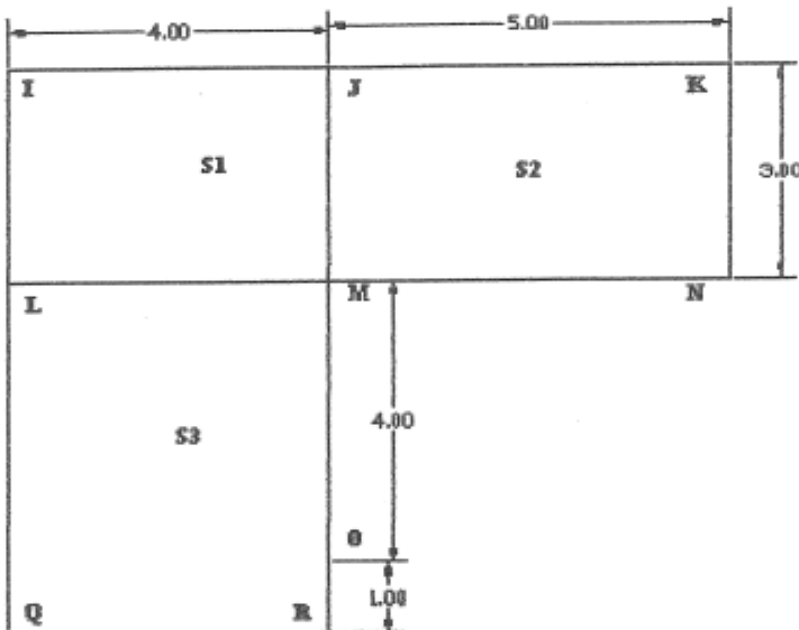


Fig (1)

OR



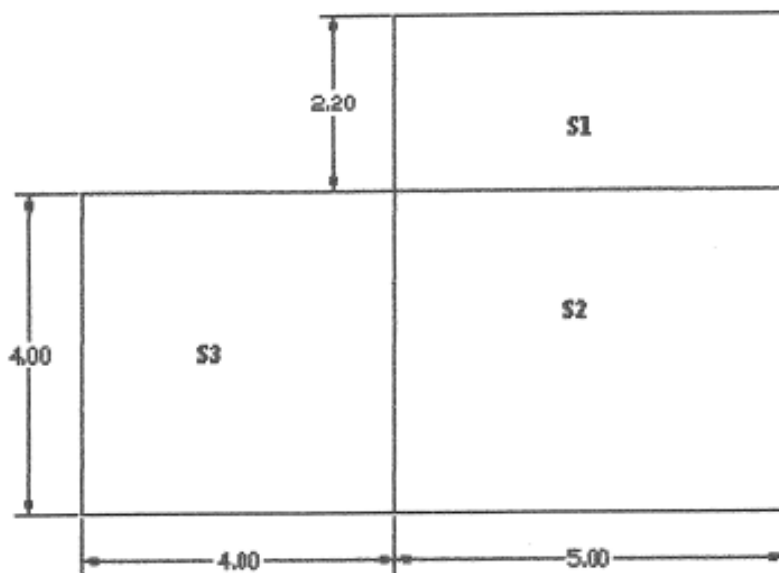
4. a) Design beam MOR in Fig. (1) by Limit State Method for flexure and shear assume columns at M and O. The overhang OR supports beam QR. The wall height, slab thicknesses and loads on slabs are same as Q3 the wall thickness on QR, OR and MO is 230 mm. Use M20 Fe 415. Sketch the reinforcement details. 17

b) Design flanged section beam by LSM for the following. 8

Effective simply supported span = 6 m, thickness of top slab = 110 mm on both the sides of the beam, width of beam web = 230 mm, ultimate udl on beam = 45 kN/m including its self weight. Material is M 20, Fe 415. Sketch the cross section showing reinforcement details.

SECTION – II

5. Figure shows in Fig. 2 center line plan of typical floor of building. Design slabs S1, S2, S3. Design the torsion reinforcement for two way slab. Show detailed design calculations and draw reinforcement details in plan and sectional elevation. Take L. L. on all slabs = 3 kN/ sqm, F. F. L. = 1.5 kN/ sqm, Material M 20 Fe 500. 25



OR Fig (2)



6. Design a dog legged staircase, first and intermediate flights for a public building with following details. **25**

Floor to floor height = 3000 mm, rise = 150 mm, tread = 300 mm, width of going and landings = 1200 mm, No. of flights = 2, Material M 20 Fe 415. Show detailed load design calculations and draw BMD for both flight and reinforcement details in sectional elevation for both flights.

7. Design a rectangular column at 'M' shown in Fig.1 in ground floor and below plinth with isolated footing for G + 2 building with the following details.

Floor to floor height for all floors = 3.3 m, Plinth to hard strata distance = 1.5 m. Take L. L. on all floor slabs = 3.3 kN/sqm, F.F.L. = 1.2 kN/sqm. L.L. on roof slab slabs = 1.5 kN/sqm WPL on roof slab = 1.5 kN/sqm, No parapet wall on roof beams, thk of walls slabs = 120 mm, thk of walls on all floor beams = 150 mm all beams are of sizes = 230×450 mm, safe bearing capacity 180 kN/ sqm, Material M 20 Fe 500. Show detailed load and design calculations and reinforcement details in plan and sectional elevation.

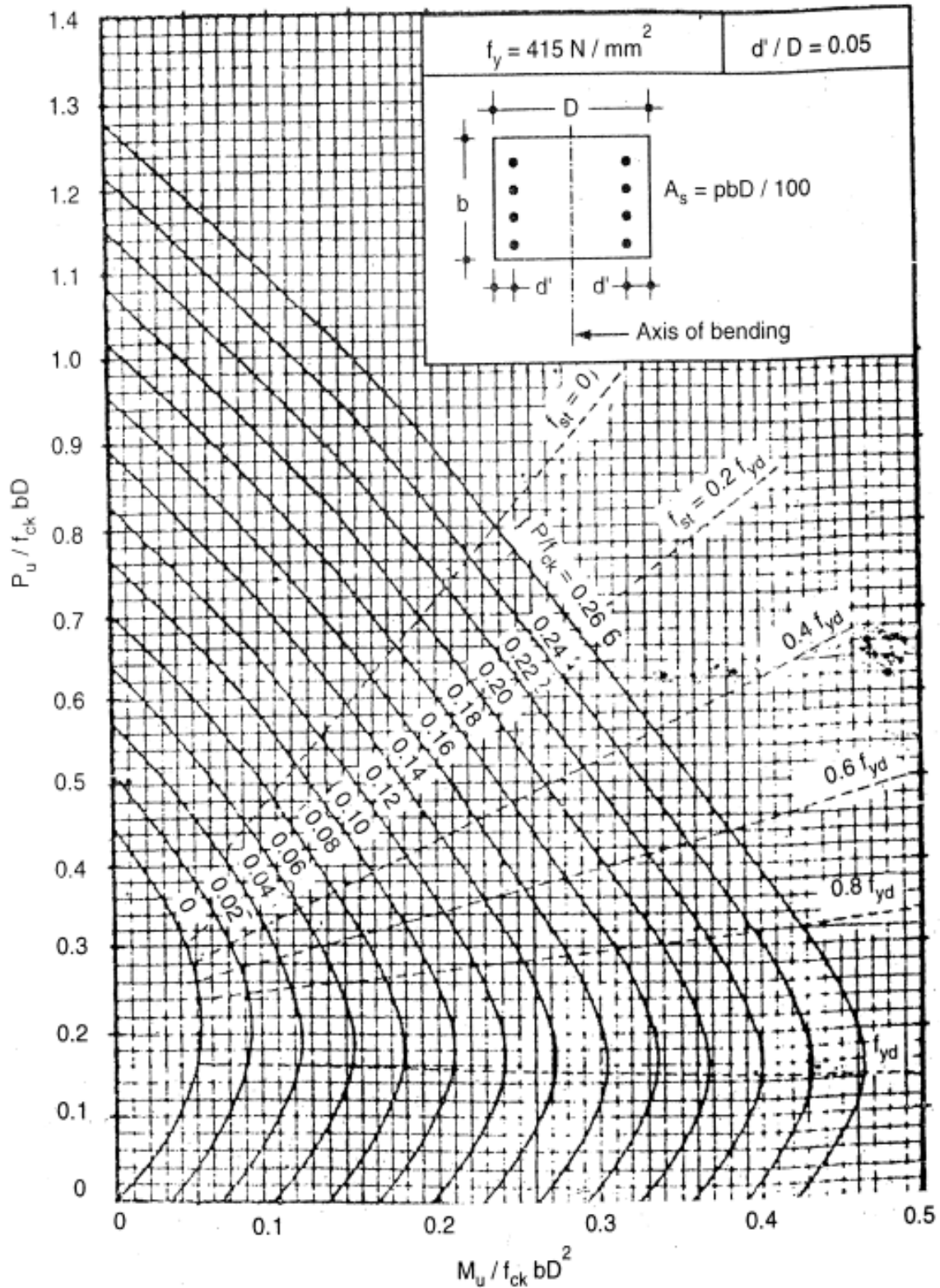
25

OR

8. Design a rectangular column with Material M 20, Fe 415 for effective height of 3.6 m carrying working axial load of 600 kN and working moment of 50 kN-m about major axis. Also design the footing for the above column considering moment. Take safe bearing capacity of the strata as 180 kN/sqm. Show detailed design calculations and reinforcement details in plan and sectional elevation. **25**



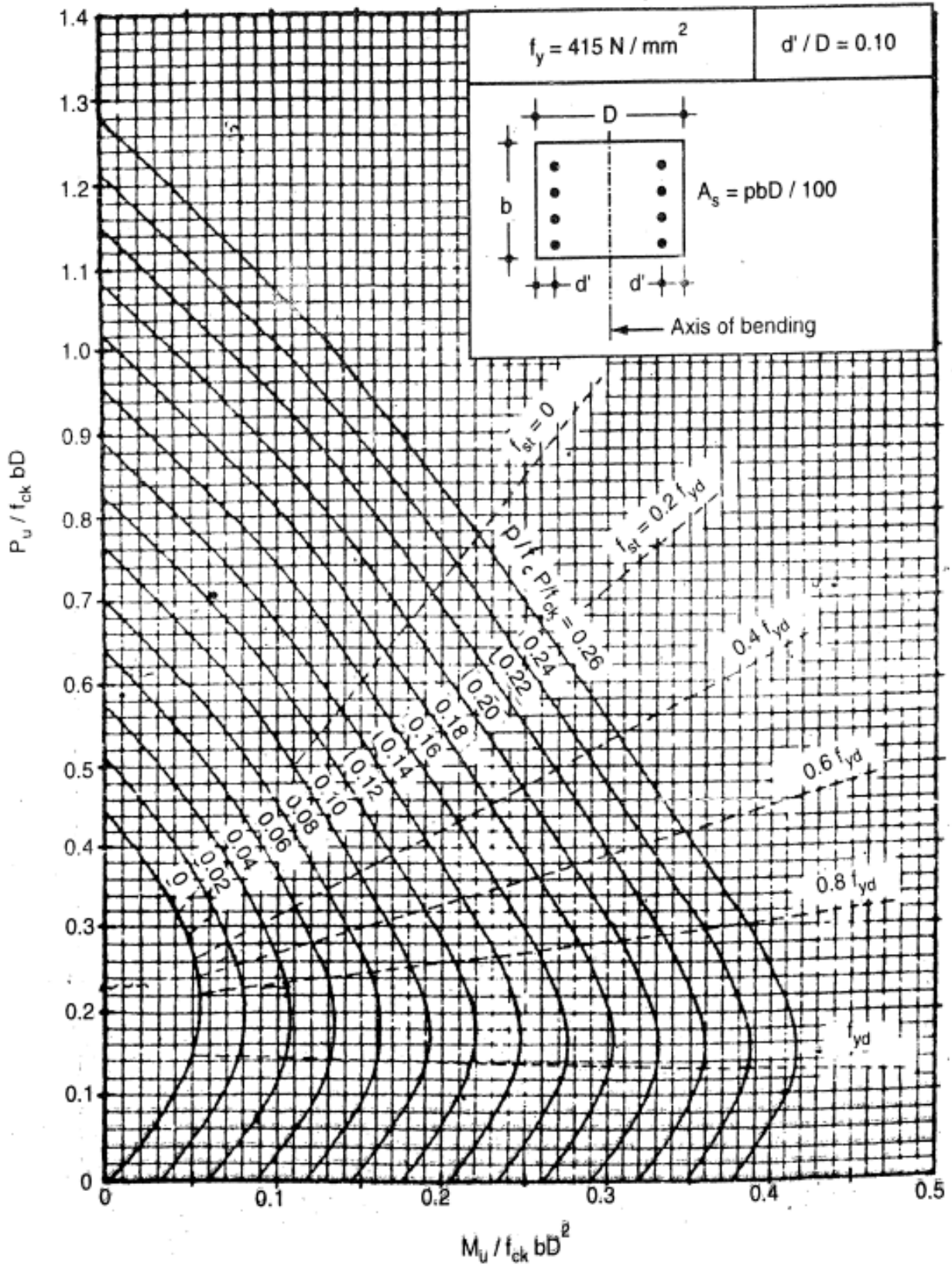
1. Interaction Diagram for Combined Bending and Compression Rectangular Section - Equal Reinforcement on Opposite sides.



(A-1)

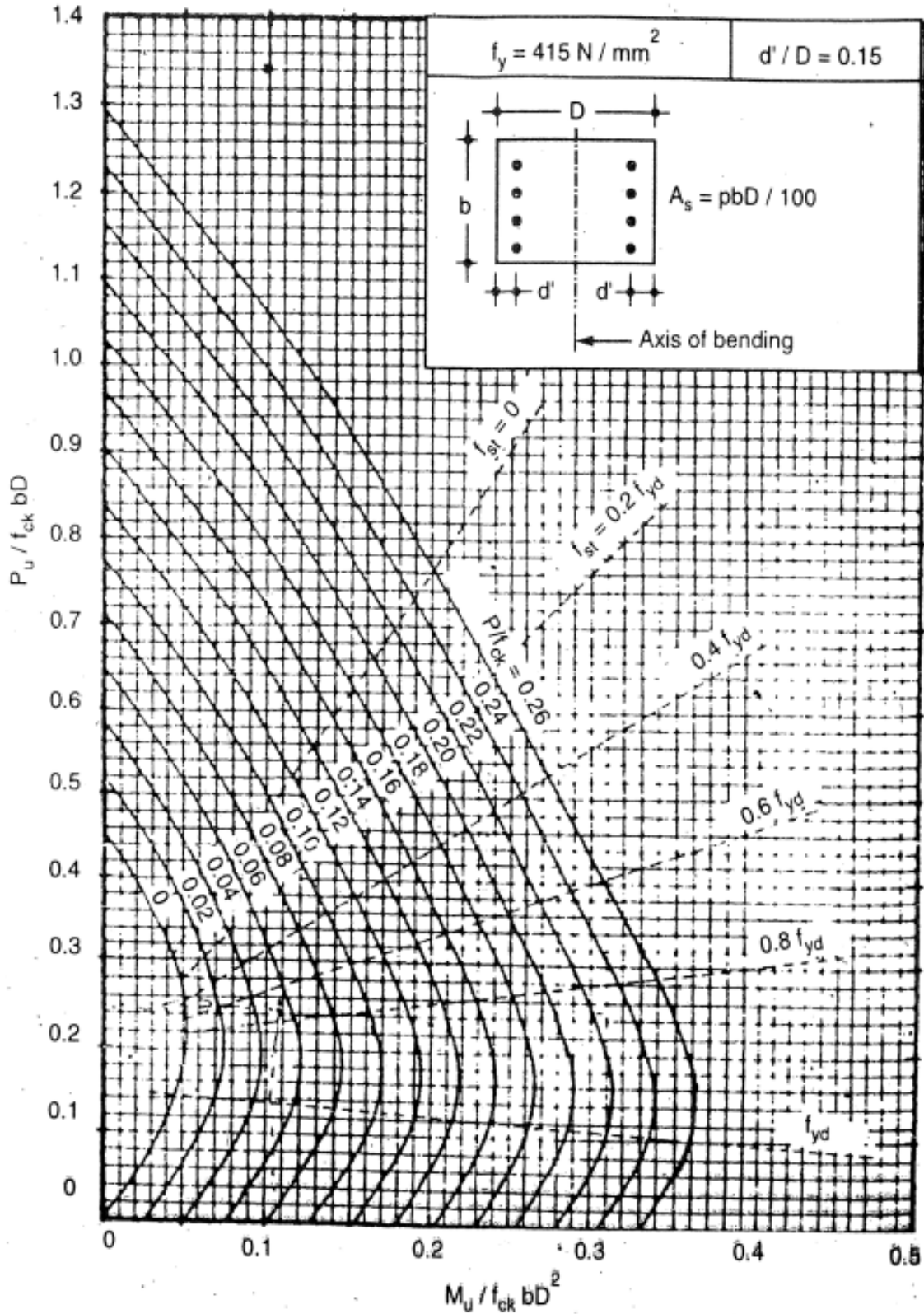


2. Interaction Diagram for Combined Bending and Compression Rectangular Section - Equal Reinforcement on Opposite sides.



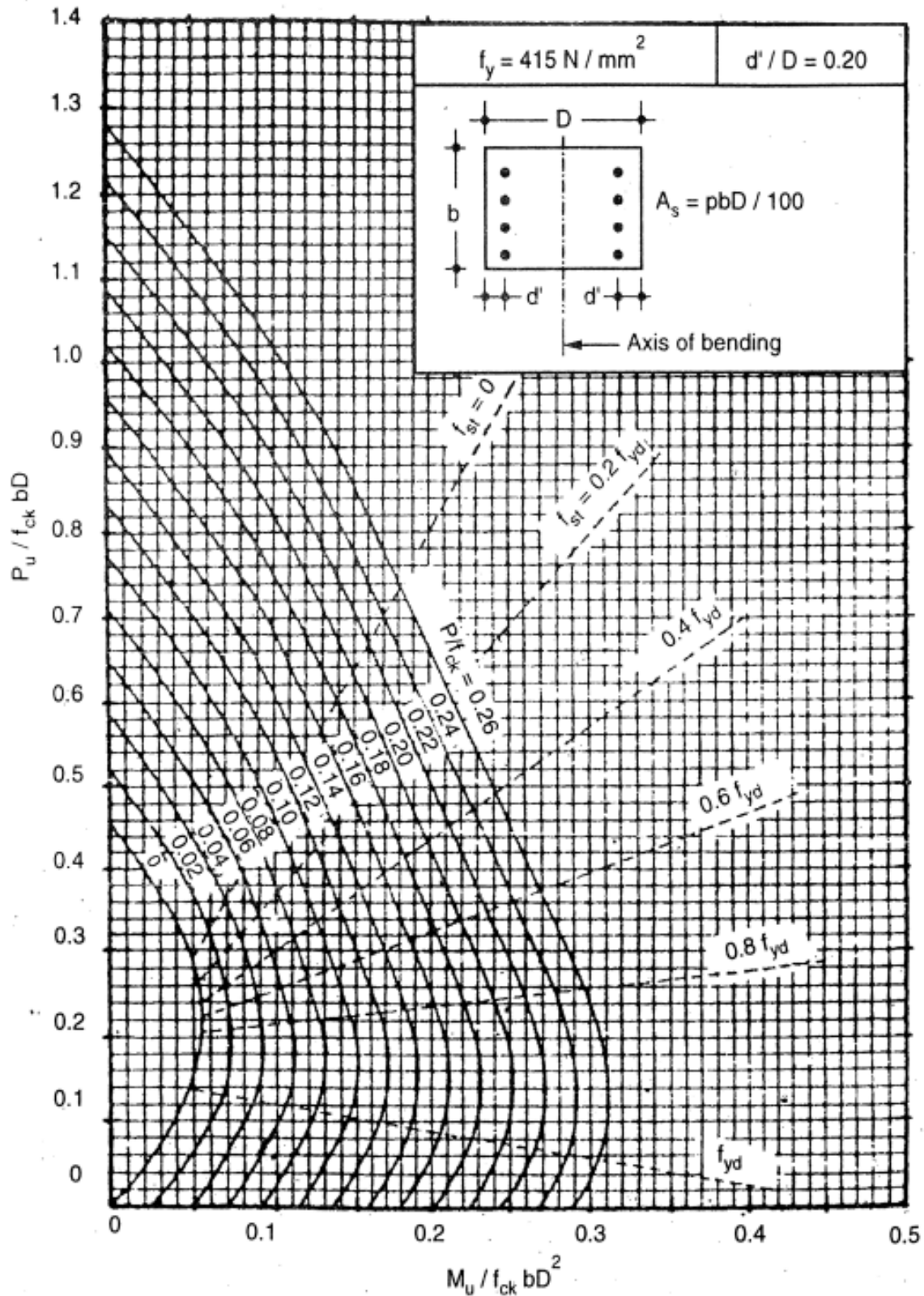


3. Interaction Diagram for Combined Bending and Compression Rectangular Section - Equal Reinforcement on Opposite sides.





4. Interaction Diagram for Combined Bending and Compression Rectangular Section - Equal Reinforcement on Opposite sides.





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T.E. (Instrumentation and Control) (Semester – II) Examination, 2011
INDUSTRIAL MANAGEMENT
(2003 Course)

Time : 3 Hours

Total Marks : 100

- Instructions :* 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) **Black** figures to the **right** indicate **full** marks.

SECTION – I

1. What is strategic management ? Evaluate mergers and acquisition as a potential business strategy with its importance to current business. **16**
- OR
2. a) Define business process re-engineering. Explain its importance to industry. **10**
- b) State and explain the concept of mind-mapping. **6**
3. a) What is statistical process control ? Explain the techniques of SPC. **8**
- b) Explain the salient features of ISO-9000 and ISO-14000. **8**
- OR
4. a) Explain the following : **10**
- i) Patent management
- ii) Diversification strategy.
- b) Evaluate the contribution of WTO to Indian Foreign Trade. **6**

P.T.O.



5. a) What is EOQ ? How it is derived ? Explain its importance to inventory management. **8**
- b) An Automobile CD uses 36,000 gear boxes per year. The ordering cost is Rs.1000/ order and inventory carrying cost is 25% of average inventory investment on annual basis. The cost per unit of gear box is Rs. 500/-. Assuming 300 working days in year, determine :
- i) EOQ
 - ii) No. of order/year
 - iii) Inventory cycle and
 - iv) Total inventory cost. **10**

OR

6. a) Describe the objectives of production planning and control. What are the techniques of PPC ? **10**
- b) State and explain the importance of supply chain management. **8**

SECTION – II

7. a) Define manpower planning. Explain the functions and process of manpower planning. **8**
- b) State and explain various methods of training imparted to industrial work force. **8**

OR

8. Differentiate between Maslow's theory and McGregor's theory of motivation. Explain the relative importance of each theory. **16**



9. a) State and explain the various costs associated with project costing. How project report is prepared ? **10**
- b) Explain the concepts : **8**
- i) Earning per share
 - ii) Return on Investment
 - iii) Pay-back period.
- OR
10. a) State and explain the importance of Balance Sheet, profit and loss A/c of a company. **10**
- b) What is letter of credit ? How it is created ? Explain the clearance procedure of LOC. **8**
11. Explain in detail the working of Company Act. 1956 and Factory Act, 1948. **16**
- OR
12. Explain the following : **16**
- i) Value added tax
 - ii) Excise duty
 - iii) Service tax
 - iv) Market participation number.
-



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**T.E. (Semester – I) (Printing) Examination, 2011
PRINTING NETWORKS AND COMPUTER GRAPHICS
(2003 Course)**

Time : 3 Hours

Max. Marks : 100

SECTION – I

1. a) Classify the following DOS commands as internal and external commands. Explain with example.
COPY, TYPE, ATTRIB, FORMAT, DIR, DEL, REN, SORT. 8
b) Write short note on MAC operating system. 8
OR
2. a) Explain windows operating system. Explain the multiuser and multitasking features of windows operating system. 8
b) What is operating system ? Give the functions and features of operating system. 8
3. a) What are design issues of networking ? Explain what the different types of networks are ? 10
b) Explain the OSI reference model in detail. 8
OR
4. a) Write short notes on : 10
1) Network topologies.
2) Pop3 and IMAP.
b) Explain IP addressing classes with examples. 8
5. a) What is internetworking ? Explain different internetworking devices. 8
b) Explain in detail VSAT. 8
OR
6. a) Explain video-conferencing in detail. 8
b) Write short notes on **(any two)** : 8
1) Routers. 2) VoN.
3) VoIP. 4) Leased Lines.

P.T.O.



SECTION – II

7. a) Explain fundamentals steps involved interface image processing. 8
b) Write short notes on : 8
1) gif. 2) pcx.
3) avi. 4) bmp.

OR
8. a) Explain the terms bit, dot, pixel related to image. 8
b) Explain : 8
1) Videoram.
2) Basic graphics system.
9. a) Write short notes on **(any two)** : 10
1) CIP4.
2) PPF in workflow.
3) Coding of PDF.
b) Explain any workflow in detail. 8

OR
10. a) What is workflow ? What are features of workflow system interface preprocess ? 10
b) Explain the integration of preprocess-press-post press. 8
11. a) Explain the digital camera interface detail and its application in field of printing. 8
b) Write short notes on : 8
1) Scanners application in printing.
2) Printers application in printing.

OR
12. a) Explain in detail. 8
1) OCR. 2) ICR.
b) Write short notes on : 8
1) Web camera.
2) Frame grabber card.



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T.E. (Semester – I) (Printing Engineering) Examination, 2011
PRINTING PROCESS INSTRUMENTATION
(2003 Course)

Time: 3 Hours

Max. Marks: 100

- Instructions :** 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) Black 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

1. a) Define the term open loop and closed loop control system. With suitable examples compare these systems. 8
- b) List and explain different types of errors in measurement system. 8

OR

2. a) Explain the terms, static characteristics and dynamic characteristics. Define the following terms :
- i) Resolution
- ii) Repeatability
- iii) Precision
- iv) Threshold. 8
- b) Compare electronic, pneumatic and hydraulic systems in detail. 8

P.T.O.



3. a) List the different methods for temperature measurement. Explain active transducer for temperature measurement in detail. **8**
- b) Justify the need of accelerometer. Explain piezoelectric type accelerometer in detail. **8**

OR

4. a) List the different methods for humidity measurement. What is the role of humidity in printing applications ? Explain any one method for humidity measurement. **8**
- b) Define the term strain gauge. Derive the equation for gauge factor. **8**
5. Write a short note on :
- i) LASCR
- ii) Opto coupler
- iii) Role of Opto devices in printing applications. **18**

OR

6. a) Explain the terms roll off rate, cut off frequency and frequency response. Explain band pass filter in detail. **10**
- b) Explain operational amplifier based sample and hold circuit in detail. **8**

SECTION – II

7. a) List the different types of controllers in detail. Explain PI controller with the help of equations and output response. **8**
- b) Explain on-off controller in detail. What are its limitations ? **8**

OR

8. a) With suitable example explain final control operation in detail. **8**
- b) What are the limitations of derivative controller ? Explain PID controller with suitable equations and response. **8**



9. a) Explain operational amplifier based PID controller. **8**
b) Explain pneumatic proportional controller in detail. **8**

OR

10. a) Explain hydraulic PID controller in detail. **8**
b) It is required to control ink flow in printing process. Design a micro controller based system which will measure and control ink flow. **8**
11. a) Define the term PLC. Compare relay logic and PLC. **8**
b) Explain multichannel data logger system which can measure four different parameters in a particular printing process application. **10**

OR

12. a) Write a short note on SCADA. **8**
b) Define the term ladder diagram. With suitable assumptions draw the block diagram and ladder diagram for bottle filling plant. **10**



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**T.E. Printing (Semester – I) Examination, 2011
REPROTECHNIQUES
(2003 Course)**

Time : 3 Hours

Max. Marks : 100

SECTION – I

1. What is original ? Also explain digital originals in detail. **18**
OR
State basic properties of originals required for reproduction. **18**
2. Explain what is screening ? Why is it required ? **16**
OR
Explain LPI system and substrate relationship. **16**
3. Explain importance of screen angle in halftone. **16**
OR
Compare AM and FM screening. **16**

SECTION – II

4. Explain structure and working of auto processor. **18**
OR
Explain advantages of CTP technology. **18**
5. Explain hybrid screening and its advantages. **16**
OR
Compare AM and FM Screening. **16**
6. What is dot gain compensation ? Explain procedure. **16**
OR
Explain transmission Densitometer structure and working. **16**



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T.E. (Semester – I) (Printing) Examination, 2011
DESIGN OF PRINTING MACHINE COMPONENTS
(2003 Course)

Time : 3 Hours

Max. Marks : 100

SECTION – I

1. a) State and explain the significance of the following : 8
 i) Factor of safety
 ii) Service factor
 iii) Overload factor.
- b) Explain B.I.S. system of designation of steels. 8
 OR
- a) Explain the types of fit using atleast three examples. 8
b) Explain briefly the various phases involved in the process of design of machine elements. 8
2. a) Explain the term ‘Factor of Safety’. Explain the factors to be considered while selecting a factor of safety. 8
b) Design a knuckle joint to withstand a tensile force of 25 kN. The material has tensile strength of 300 N/mm². Assume factor of safety of 5. $S_{yt} = S_{yc} = 300 \text{ N/mm}^2$. 8
 OR
- a) Explain the step by step procedure of design of cotter joint. 8
b) Draw the sketch of knuckle joint. Also design the knuckle joint to carry axial tension of 1000 N. The permissible tensile and shear stress for knuckle joint are 80 MPa and 40 MPa respectively. The permissible stresses for knuckle pin are 110 MPa and 55 MPa. 8
3. a) Explain ASME code procedure of design of shaft. 8
b) Design the shaft on basis of torsional rigidity and equivalent bending moment approach. 10
 OR
- b) A shaft is supported on two bearings 600 mm apart. A pulley of 500 mm dia. at 250 mm from left hand support. The belts are horizontal and parallel having total tension 9900 N. The weight of pulley is 900 N.
If tight side tension in belt is 7200 N and slack side tension is 2700 N. and shaft rotates at 1000 rpm.

P.T.O.



Find power transmitted by shaft and find diameter of shaft. Take coefficient of friction between belt and pulley as 0.3. Take allowable stresses as 55 MPa in tension and 42 MPa in shear.

18

SECTION – II

4. a) Prove that maximum efficiency of square threaded screw can be given by

$$\eta_{\max} = \frac{1 - \sin \theta}{1 + \sin \theta} \quad 10$$

- b) What are the different types of stresses induced in power screw ? 6

OR

- a) Derive the relation for torque required to raise load on square threaded screw. 10

- b) An electric motor driven power screw moves a nut in a horizontal plane against a force of 75 kN, at a speed of 30 cm/min. The screw is a single square threaded of 6 mm pitch and has a major diameter of 40 mm. If the coefficient of friction at screw thread is 0.1, estimate power of motor. 6

5. a) Explain advantages and limitation of welded joints. 8

- b) Explain welded symbols. 8

OR

- a) Explain the basic types of screw fastenings. 8

- b) Explain design of bolt under tension. 8

6. a) Derive the load-stress equation of helical spring. 8

- b) A closed coil helical spring is made of 10 mm diameter steel wire, the coils consisting 10 complete turns with mean diameter of 120 mm. The spring carries axial pull of 200 N. Determine shear stress induced in spring neglecting effect of concentration. 10

OR

Explain the following :

- a) Terminology of spring
 b) Wahl factor
 c) Derive the relation for deflection of helical torsion spring. 18



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T.E. (Printing) (Semester – II) Examination, 2011
DIGITAL COLOUR IMAGING AND COLOUR MANAGEMENT
(2003 Course)

Time : 3 Hours

Max. Marks : 100

- Instructions :** 1) Answer to the **two** Sections should be written in **separate** books.
2) **Neat** diagrams must be drawn **wherever** necessary.
3) **Black figures** to the **right** indicate **full** marks.

SECTION – I

1. Solve **any two** : **18**
A) Explain the electromagnetic spectrum.
B) Explain Tristimulus human vision theory.
C) Explain simultaneous contrast and chromatic adaption.
2. Solve **any two** : **16**
A) Explain color system based on color matching function – CIE xyY.
B) Explain the measurement geometry 45/0 and 0/45 of measuring instrument.
C) Explain the principle and construction of spectrophotometer.
3. Answer **any two** : **16**
A) Explain the device dependent and device independent workflow.
B) Explain input profile and output profile.
C) Explain the 4 c's of color management.

SECTION – II

4. Answer **any two** : **18**
A) Explain sRGB Gamut, CMYK Gamut.
B) How to apply input and output profile in photoshop software ?
C) Explain perceptual rendering intent and their application.

P.T.O.



5. Answer **any two** : **16**

- A) Workflow for press standardization for offset process. Explain with example from pre press to press.
- B) Explain quality control aids used for press standardization.
- C) Explain the term standardization and need of press standardization.

6. Answer **any one** : **16**

- A) Explain Drum scanner and flat bed scanner.
- B) Explain Ink Jet printing technology.



[4063] – 9

T.E. (Civil) (Semester – II) Examination, 2011
ENVIRONMENTAL ENGINEERING – I
(2003 Course)

Time : 3 Hours

Max. Marks : 100

- Instructions :** 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) Answer 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

1. a) Explain various techniques used to control noise pollution. **6**
- b) Define : Sound intensity level, Sound power level, Speed of sound and Sound intensity. **6**
- c) Explain
- i) Solid waste
- ii) Water pollution. **4**

OR

2. a) Write short note on : **6**
- i) Sanitary landfill
- ii) Composting
- b) Explain on site handling, storage and processing of solid wastes. **6**
- c) Explain manual component separation method of processing technique. **4**

P.T.O.



3. a) What are the effects of particulate matter on human health and materials ? **6**
 b) Explain working principle of fabric filter with a neat sketch. **6**
 c) Explain :
 i) Radiation inversion
 ii) Subsidence inversion. **4**

OR

4. Write short note on (**any four**) : **16**
 i) Green house effect
 ii) Electrostatic precipitator
 iii) Control of vehicular pollution
 iv) Wind rose
 v) Ozone depletion.

5. a) What is the necessity of water supply scheme ? Describe different phases involved in a water supply scheme. **6**
 b) Explain factors affecting water demand. **6**
 c) Estimate forecast population at the end of the year 2041 by geometrical increase method with the help of following data. **6**

Year	1971	1981	1991	2001	2011
Population	42,000	54,000	61,000	75,000	89,000

OR

6. a) Explain methods of rain water harvesting system with a sketch. **6**
 b) Write distribution forms and effects of alkalinity. **6**
 c) Write down the Indian standards for the quality of potable water for. **6**
 i) pH
 ii) Colour
 iii) Sulphates
 iv) Iron
 v) Turbidity
 vi) Chlorides.



SECTION – II

7. a) A water treatment plant treats 250 m³/hr of water. Work out the following with respect to flocculator : 8
- i) Dimensions of flocculator unit
 - ii) Power input
 - iii) Size and number of paddles.

Assume water temperature = 25°C and $\mu = 0.89 \times 10^{-3} \text{ N.s/m}^2$. Draw a plan and section of designed flocculator unit.

- b) Explain with a neat sketch, inlet and outlet arrangements adopted for a rectangular sedimentation tank. 8

OR

8. a) Explain theory of sedimentation tank. Prove that theoretically, the surface loading Q/A and not the depth of water is a measure of effective removal of particles in a sedimentation tank. 8

- b) Calculate the quantity of lime and soda for cold softening of 2,50,000 lit. of raw water to be supplied everyday, for which the following chemical composition has been found out. 8

Dissolved CO₂ = 39.6 mg/lit.

Ca⁺⁺ = 44 mg/lit

Mg⁺⁺ = 18 mg/lit

Alkalinity, HCO₃⁻ = 122mg /lit .

9. a) Design a set of rapid sand filters for treating water required for a population of 80,000. Rate of water supply = 200 lit/h/day. The filters are rated to work at 5000 lit/h/m². Show the arrangement of filter units. 8

- b) Explain break point chlorination with sketch. 4

- c) Explain ion exchange method of water softening. 4

OR

10. a) Write comparison of slow and rapids and filter in tabular form with reference to 10
- i) Economy
 - ii) Loss of head
 - iii) Rate of filtration
 - iv) Size of bed
 - v) Quantity of wash water



- vi) Skilled supervision
- vii) Method of cleaning
- viii) Coagulation
- ix) Depth of gravel and sand bed and
- x) Filter media-effective size and uniformity coefficient of sand.

b) Explain reverse osmosis and electro dialysis. 6

11. a) What is the purpose of ESR ? Explain how its capacity is calculated ? 6

b) Differentiate between fire and break down reserve. 6

c) Compare continuous and intermittent systems of water supply. 6

OR

12. a) Write short note on : 9

i) Zoning of areas

ii) Dead end system

iii) Pressure in the distribution system.

b) A town with a population of one million has a continuous water supply. Rate of water supply is 270 lit/hr/day. Break-up of water demand is as follows : 9

Time	Litres per capita
6 am to 11 am	90
11 am to 3 pm	60
3 pm to 9 pm	80
9 pm to 12 pm	25
12 pm to 6 am	15

Water is supplied from the treatment plant at a uniform rate of 11.25 million lit/hour for all 24 hours. Find the balancing capacity of the reservoir required by the analytical method.



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**T.E. (Chemical) (Semester – I) Examination, 2011
CHEMICAL ENGINEERING MATHEMATICS
(2003 Course)**

Time : 3 Hours

Max. Marks : 100

- Instructions :** 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 logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.
6) Assume suitable data, if necessary.

SECTION – I

1. a) Solve the following equations using Gauss Elimination method. 9

$$2x_1 - 3x_2 - 4x_3 = 11$$

$$9x_1 + 2x_2 - 8x_3 = 1.9$$

$$15x_1 - 8x_2 + 6x_3 = 14.7$$

- b) State the convergence criteria for the Gauss Seidal method. 9

OR

2. a) State and explain Pitfalls of elimination method. 9
b) State and explain three categories in which systems of linear algebraic equations can be classified. 9

P.T.O.



3. a) A compound material balance around a chemical reactor yields the following steady state equation.

$$0 = \frac{F}{V} C_{in} - \frac{F}{V} C - KC^{2.5}$$

where $\frac{F}{V} = 0.1 \text{ min}^{-1}$

$$C_{in} = 1 \text{ kg mol/m}^3, K = 0.05 \text{ m}^{4.5}/\text{kg mol}^{1.5} \text{ min.}$$

Perform 8 iterations using Newton-Raphson method with an initial guess $C = 1.0$.

10

- b) Give the graphical interpretation of Newton – Raphson method.

6

OR

4. a) A missile is launched from a ground station. The acceleration during its first 80 seconds of flight, as recorded, is given in the following table.

t(s)	0	10	20	30	40	50	60	70	80
a m/s²	30	31.63	33.34	35.47	37.75	40.37	43.25	46.69	50.67

Compute the velocity of the missile when $t = 80$ sec. using Simpsons $\frac{1}{3}$ rule.

8

- b) State and explain the Geometric interpretation of Eulers method.

8

5. Establish a relation between adjacent cells with approximate step size for finite difference approximation.

16

OR

6. Solve $\frac{d^2 y}{dx^2} + y = 0$ with boundary conditions

$$y = 0 \text{ when } x = 0$$

$$y = 0 \text{ when } x = 1$$

Find y at $x = 0.5$.

16



SECTION – II

7. a) By using the method of least square find a relation of the form $y = ax^b$, that fits the data. 8

x	2	3	4	5
y	27.8	62.1	110	161

- b) Explain linear regression for least squares. 8

OR

8. a) What are the quantification of error of linear regression. 8

- b) Using the principle of least squares, fit an equation of the form $y = ae^{bx}$ to the data. 8

x	1	2	3	4
y	1.65	2.70	4.50	7.35

9. Determine whether each of following quantities is a tensor. If so state whether it is contravariant or covariant and give its rank.

a) dx^k

b) $\frac{\partial \phi}{\partial x^k}$ (x^1, \dots, x^N). 16

OR

10. a) Explain tensor components in a curvilinear co-ordinates. 8

- b) What are different fundamental operations with tensor, explain in brief. 8



11. a) What are the six steps of optimization ?

6

b) Maximize $z = 14x + 20y$

Subjected to condition

$$20x + 6y \leq 1000$$

$$\text{and } 40x + 8y \leq 500$$

$$x, y \geq 0$$

12

OR

12. A company making cold drinks has two bottling plants located at towns T_1 and T_2 . Each plant produces three drinks A, B and C and their production capacity per day is shown below :

Cold drinks	Plants at	
	T_1	T_2
A	6000	2000
B	1000	2500
C	3000	3000

The marketing department of the company forecasts a demand of 80000 bottles of A, 22000 bottles of B and 40000 bottles of C during month of June. The operating cost per day of plants at T_1 and T_2 are 6,000 and Rs. 4,000 respectively. Find the number of days for which each plant must be run in June so as to minimize the operating cost while meeting the marketing demand.

18



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T.E. (Semester – I) (Chemical Engineering) Examination, 2011
MASS TRANSFER – I
(Common to Bio-Technology)
(2003 Course)

Time : 3 Hours

Max. Marks : 100

- Instructions :** 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 rules, Mollier charts, electronic pocket calculator and steam tables is allowed.
- 5) Assume **suitable** data, if necessary.

SECTION – I

1. i) Derive the expression for steady state equi-molar counter diffusion. **5**
- ii) Derive the flux equation N_A for steady state diffusion of A through non-diffusing B. Also graphically represent pressure Vs distance plot of diffusion of A through stagnant B. **5**
- iii) Methane diffuses at steady state through a tube containing helium. At point 1, the partial pressure of methane is $P_{A1} = 55$ Kpa and at point 2, 0.03 m apart, $P_{A2} = 15$ kPa. The total pressure is 101.32 and the temperature is 298 K. At this temperature and pressure $D_{AB} = 6.75 \times 10^{-5}$ m²/s. Calculate the flux of CH₄ at steady state for equi-molar counter diffusion. **6**

OR

P.T.O.



2. A) Oxygen (A) is diffusing through carbon monoxide under steady state conditions with the carbon monoxide nondiffusing. The total pressure is $1 \times 10^5 \text{ N/m}^2$ and the temperature 0°C . The partial pressure of Oxygen at two planes 2 mm apart is respectively 13000 N/m^2 and 65000 N/m^2 the diffusivity for mixture is $1.86 \times 10^{-5} \text{ m}^2/\text{s}$. Calculate the rate of diffusion of Oxygen in Kmol/s through each square meter of two planes. $R = 8314 \text{ N.m/Kmol}$. 8
- B) Calculate the rate of diffusion of acetic acid (A) across a film of nondiffusing water (B) solution 1 mm thick at 17°C when the concentrations on opposite side of the film are 9 and 3 wt% acid. The diffusivity of acetic acid in the solution is $0.95 \times 10^{-9} \text{ m}^2/\text{s}$. Mol wt of acetic acid is 60.03 and water is 18.02. The density of 9% solution is 1013 kg/m^3 . The density of 3 % solution is 1004.2 kg/m^3 (5 marks). 8
3. i) Derive the overall mass transfer coefficient based on interface mass transfer theory and resistances $1/K_y = 1/k_y + m'/k_x$, explain mass transfer rate is gas phase control and liquid phase control. 8
- ii) Chilton and Colubern analogy for determination of mass transfer coefficient. 4
- iii) Surface renewal theory for determination of mass transfer coefficient. 4

OR

4. a) In wetted wall column there is absorption of SO_2 by means of water which is flowing down as a thin liquid film on the inside surface of the column SO_2 - Air mixture is flowing from the bottom to the top of the column. The equilibrium relationship at given operating conditions as follows
- SO_2 composition in main gas stream is 0.35 mole fraction and main liquid stream is 0.12 and equilibrium composition at fix conditions of temperature and pressure are 0.2 and 0.285 respectively in gas and liquid phase determine individual Mass transfer coefficient. (assume suitable data if required)
- Equilibrium data is as follows 10

X_{SO_2} (mole fraction of SO_2)	0.07	0.21	0.285	0.33	0.385
Y_{SO_2} mole fraction	0.03	0.12	0.2	0.275	0.42

- b) Explain using suitable diagram and graph for
- continuous concurrent,
 - countercurrent and crosscurrent processes,
 - cascades along.

6



5. a) A counter current plate absorber is to be installed for scrubbing of an air mixture contain 4% ammonia by volume. The scrubber is fed with water containing 0.002 mole NH_3 per mole of water. The scrubbing water flows at rate of 1 mole water per mole air. It is necessary to absorb 85% of the ammonia present in the gas by operating the absorber at 25°C . Equilibrium relationship is $y = 0.80x$. Calculate the number of plates analytically (Kremser equation). **12**
- b) With neat sketches explain the minimum L/G ratio for absorber. **6**

OR

- 6 A) What are the important properties of solvent need to consider for absorption of Gas ? **6**
- B) Derive basic expression of material balance for single component absorption process and with appropriate graphical representation show the procedure for determination of number of trays. **6**
- C) Derive the expression for finding Height $Z = \text{HTUXNTU}$ for packed bed absorption column. **6**

SECTION – II

7. A) The temperature of air in a room is 40.2°C and the total pressure is 101.3 kPa. The air contains the water vapour with a partial pressure $P_A = 3.74$ kPa. Calculate humidity and Saturation humidity and percentage humidity Data : vapor pressure of water is $P_{AS} = 7.415$ kPa at 40°C . **6**
- B) Derive the relation for wet bulb temperature and Lewis relationship. **10**

OR

8. i) List the names of different types of Gas - liquid contact operations in humidification and dehumidification operation. **4**
- ii) Explain the construction of natural draft cooling tower along with figure. **8**
- iii) Explain seven lines of psychometric charts using schematic representation. **4**



9. a) Sheet material measuring 1 m^2 and 5 cm thick is to be dried from 40% to 5% moisture under constant drying conditions. The density of dry material is 450 kg/m^3 and its equilibrium moisture content is 2% . The available drying surface is 1 m^2 . The experiments showed that the rate of drying was constant at $4.8 \text{ kg (hr) (m}^2)$ between moisture contents and after the rate decreased linear. Calculate the total time required to dry the material from 45% to 5% all the moisture contents on wet basis (assume suitable data if required). **10**
- b) Explain movement of moisture within the solid. **6**
- OR
10. a) Explain the following terms : **10**
- i) Equilibrium moisture content.
 - ii) Bound Moisture.
 - iii) Unbound moisture.
 - iv) Free moisture.
 - v) Rate of drying.
- b) A porous solid is dried in the batch drier under constant drying conditions 6 hours are required to reduce the moisture content from 30% to 10% . The critical moisture content is found to be 16% and equilibrium moisture content is 2% . All moisture content are in dry basis. Assume the rate of drying during falling rate period is proportional to free moisture content. How long it will take to dry the same solid from 35% to 6% ? **6**
11. Attempt the following :
- i) Using Schematic representation explain the operating characteristics of tray such as Flooding Weeping Coning and Dumping and Priming. **6**
 - ii) Sprarged vessel (bubble column) design considerations. **6**
 - iii) Tray tower vs Packed tower. **6**
- OR
12. Write a note on (any three) **18**
- i) Explain basic requirements of packing and selection of packing in packed column.
 - ii) Write a note on Venturi scrubber.
 - iii) Concept of HETP.
 - iv) Pressure drop in packed column.



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T.E. (Chemical) (Semester – I) Examination, 2011
PROCESS INSTRUMENTATION AND INSTRUMENTAL ANALYSIS
(2003 Course)

Time : 3 Hours

Max. Marks : 100

- Instructions :*
- 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

1. a) Explain the importance of instrumentation process in industries. **6**
- b) Differentiate between analog and digital instruments. **4**
- c) Define measurement and explain its significance in our day-to-day life and in various fields of engineering. **8**

OR

2. a) Explain static and dynamic characteristics of measuring instruments. **8**
- b) What is calibration ? State the methods for calibrating the measuring instrument. **6**
- c) Distinguish between self operated and power operated instrument. **4**
3. a) Describe the operating principle, construction and working of optical pyrometer. **8**
- b) Explain working of industrial mercury in glass thermometer, with the help of a neat diagram. **8**

OR

P.T.O.



4. a) A certain mercury in glass thermometer is graduated for a total immersion and used in a situation where it is immersed to the 100 degree mark on the scale. The thermometer indicates a temperature of 250°C , and the mean temperature of the emergent column is estimated at 150°C . Determine the correct temperature of the bulb. **8**
- b) Explain Seebeck effect and its application in working of a temperature measuring instrument. Name the instrument with its working diagram. **8**
5. a) Enumerate the desirable characteristics of manometric liquids. Name some of the manometric liquids and point their fields of application, advantages and limitations. **10**
- b) Explain inclined leg manometer. **6**
- OR
6. a) Explain any one type of high pressure sensor in detail. **8**
- b) Explain construction and working of Pirani vacuum guage. **8**

SECTION – II

7. a) Why is a rotameter called variable area meter ? Sketch and explain its working. **8**
- b) Discuss Pitot Tube in detail. **8**
- OR
8. a) Describe the principle, construction and working of Electromagnetic flow meter. **10**
- b) Describe Venturimeter in detail. **6**
9. a) Explain construction and working of Air purge method and its application. **8**
- b) Write short notes on : **8**
- 1) Bob and tape method
 - 2) Diaphragm box method.

OR



10. a) Explain with neat diagram of air trap method for liquid level measurement. **8**
- b) What are the objectives to use of sight glass and float glass for level measurement ? **8**
11. a) Describe various viscosity measuring devices. **8**
- b) Explain chromatography in detail. **10**
- OR
12. Write short notes on : **18**
- 1) HPLC
 - 2) Mass spectroscopy
 - 3) Conductivity cell
 - 4) I.R. Absorption spectroscopy.



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T.E. (Chemical) (Semester – I) Examination, 2011
PROCESS EQUIPMENT DESIGN – I
(2003 Course)

Time : 3 Hours

Max. Marks : 100

- Instructions :** 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) **Black** 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

1. a) Write a note on design of various types of heads for pressure vessels. **8**
b) Define pressure vessel and explain general design considerations for the design of unfired pressure vessel. **8**
OR
2. a) With neat sketch explain the reinforcement of nozzle. **8**
b) A cylindrical pressure vessel with 2m ID is to be operated at a pressure of 4 kgf/cm². The permissible stress of the material is 960 kgf/cm², welded joint efficiency is 85%. Calculate the thickness required. If this vessel is fabricated in the spherical form, what maximum pressure will it be able to withstand ? **8**
3. a) What are the constructional features of high pressure vessels ? Draw neat diagrams and explain in detail. **8**
b) If R_1 , R_2 and R_3 are three different concentric radii of multi-shell then prove that $R_2 = \sqrt{R_1 R_3}$ for optimum design of multi-shell construction or shrink-fit construction. **10**
OR
4. a) Explain the step-wise design procedure of skirt support for tall vessels. **8**
b) Draw and explain different types of supports and explain design procedure of saddle support in detail. **10**

P.T.O.



5. a) Draw and explain various types of roofs used for storage vessels. **8**
 b) What are the major losses that can occur in storage tanks ? Explain the breathing loss mechanism in detail. **8**

OR

6. a) A crude oil has to be stored in large storage vessel, whose density is 917 kg/m^3 and quantity is 50,000 kg. If the plates in the size of $1.3 \text{ m} \times 2.6 \text{ m}$ in different thicknesses are available for fabrication, estimate the total number of plates required for fabrication of storage tank. The diameter of vessel is 2.6 m. Welded joint efficiency is 85%. Permissible stress of material = 1020 kgf/m^2 . **10**
 b) What type of vessels are used for storage of gases ? Why ? **6**

SECTION – II

7. a) Explain the step-wise design procedure of shell and tube heat exchanger with neat diagram. **8**
 b) 54000 kg/hr. of Benzene is cooled by pumping it through the shell side of shell and tube heat exchanger of 1000 mm ID shell, fitted with 5000 mm long tubes of 19 mm OD, arranged on 25 mm square pitch with 6 mm clearance. If the baffle spacing is 250 mm, calculate the shell side pressure drop.

Data :

Viscosity of Benzene = $0.5 \times 10^{-3} \text{ kg/(m-sec.)}$

Density of Benzene = 881 kg/m^3 .

Following equation in consistent units may be used for calculating pressure drop.

$$\Delta P_s = \frac{F_s G_s^2 (n+1) ds}{2\rho \cdot d_e} \text{ where}$$

F_s = Shell side friction factor depends on NRe

G_s = Mass velocity of shell side flow ($\text{kg/m}^2\text{-sec}$)

n = Number of baffles

d_e = Equivalent diameter

d_s = Shell ID

Take $F_s = 0.28$ for above flow-rate of Benzene. **8**

OR



8. a) Describe backward feed method for tripple effect evaporators with its material and energy balances. **8**
- b) Explain briefly, how the feed/product characteristics like concentration, foaming tendency, temperature sensitivity and scaling tendency affect the process design of evaporators. **8**
9. Write a short note on following : **18**
- a) Design of bayonet heat exchanger
- b) Plate heat exchanger
- c) LMTD and its correction factor for multipass shell and tube heat exchanger.
- OR
10. a) Explain the advantages, disadvantages of a fixed tube sheet, U-tube and floating head, shell and tube heat exchanger. **10**
- b) Describe various types of baffles used for shell and tube heat exchanger with neat sketches. **8**
11. Draw the sketch and write a note on the following (**any three**) : **16**
- a) Rotary drum filter
- b) Plate and frame filter press
- c) Classification of filters
- d) Vapor recompression used in multiple effect evaporator system.
- OR
12. a) Explain basket type centrifuge with neat diagram. **8**
- b) Calculate the maximum safe speed of rotation of a phosphor bronze centrifuge 0.3 m in diameter and 5 mm thick, when it contains a liquid of density 1000 kg/m^3 forming a layer of 75 mm thickness of wall. Density of phosphor bronze is 8900 kg/m^3 . Take safe working stress of 55 MN/m^2 . **8**



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T.E. (Chemical) (Semester – I) Examination, 2011
CHEMICAL ENGINEERING THERMODYNAMICS – II
(2003 Course)

Time : 3 Hours

Max. Marks : 100

- Instructions :** 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) **Black** 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

1. a) For a binary system show that any thermodynamic solution property is related with its component partial molar properties as 8

$$\bar{M}_1 = M + x_2 \frac{dM}{dx_1}$$

$$\bar{M}_2 = M - x_1 \frac{dM}{dx_1}$$

- b) Calculate the fugacity of isobutane at 154.5°C and 8620 kPa by using Redlich-Kwong- Soave equation. Its molar volume is 0.154 m³/kmol. T_c=135°C, P_c = 3648 kPa, eccentric factor = 0.1756. 10

OR

2. a) Derive the fundamental property relation for open system.

$$d(nG) = (nv)dp - (ns)dT + \sum u_i dni. \quad 5$$

- b) Derive Gibbs -Duhem equation $\sum x_i d\bar{M}_i = 0$. 4

- c) A 30 mol% methanol water solution is to be prepared. How many cubic meters of pure methanol (molar volume, 40.727×10⁻⁶ m³/mol) and pure water (molar volume, 18.068×10⁻⁶ m³/mol) are to be mixed to prepare 2 m³ of the desired solution. The partial molar volumes of methanol and water in a 30% solution are 38.632×10⁻⁶ m³/mol and 17.765×10⁻⁶ m³/mol respectively. 9

P.T.O.



3. a) Derive the relation to show variation of activity coefficient with respect to temperature and pressure. 8
- b) The van Laar constants A and B for the system ethanol (1) and benzene (2) at 50 °C are 1.7910 and 1.8262 respectively. Calculate the activity coefficients of the components in a solution containing 60 mol% ethanol. 8

OR

4. The excess Gibbs energy of a binary liquid mixture at T and P is given by
- $$\frac{G^E}{RT} = (-2.6x_1 - 1.8x_2)x_1x_2$$
- a) Find expressions for γ_1 and γ_2 at T and P.
- b) Show that these expressions satisfy Gibbs-Duhem equation.
- c) Plot $\frac{G^E}{RT}$, $\ln \gamma_1$ and $\ln \gamma_2$ versus X_1 . 16

5. a) Explain the following laws with their applicability in the context of VLE
- i) Daltons law
- ii) Raoult's law. 4

- b) Assuming the validity of Raoult's law, do the following calculations for benzene (1) and Toluene (2) System

- i) Given $x_1=0.33$ and $T=373.15$ K find y_1 and P.
- ii) Given $y_1=0.33$ and $T=373.15$ K find x_1 and P.
- iii) Given $x_1=0.33$ and $P = 120$ kPa find y_1 and T. Parameters for Antoine equation are

Component	A	B	C
Benzene (1)	13.8594	2773.78	-53.08
Toluene (2)	14.0098	3103.01	-53.36

12

OR

6. a) A liquid mixture of cyclohexane (1) and phenol (2) for which $x_1 = 0.6$ is in equilibrium with its vapor at 417.15 K. Determine the equilibrium pressure P and vapor composition y_1 from the following information :
- $$\ln \gamma_1 = A x_1^2, \ln \gamma_2 = B x_2^2 \text{ at } 417.15 \text{ K, } P_1^{\text{sat}} = 1.24 \text{ bar, } P_2^{\text{sat}} = 0.89 \text{ bar.}$$
- The system forms an azeotrope at 417.15 K for which $x_1^{\text{az}} = y_1^{\text{az}} = 0.294$. 10
- b) Explain phase rule for non reacting system with suitable example. 6



SECTION – II

7. a) Write a note on phase equilibria in multicomponent systems. **8**
- b) Explain liquid liquid equilibrium diagram on triangular coordinates for a system in which one pair is partially soluble. Explain the significance of plait point and tie line. **8**

OR

8. a) The following results were obtained by experimental VLE measurements on the system ethanol 1) Benzene 2) At 101.3 kPa. Test whether the data are thermodynamically consistent or not.

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

9

- b) Derive the Clapeyron equation using the criteria of phase equilibrium. **7**
9. a) Derive the relationship between mole fractions of species in multiple reactions and the extent of reactions. **8**
- b) n-Butane is isomerised to i-butane at moderate temperatures. It is found that the equilibrium is attained at following compositions

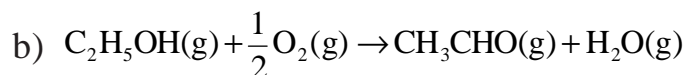
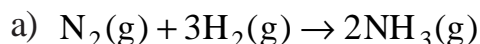
Temperature , k	Mol % , n-butane
317	31.00
391	43.00

Assuming that the activities are equal to the mole fractions, calculate the standard free energy of the reaction at 317 k and 391 k and average value of heat of reaction over this temperature range. **8**

OR



10. a) Calculate the standard Gibbs free energy change and the equilibrium constant at 298.15 K for the following reactions.



Free energies of formation at 298.15 K are given as follows.

$$\Delta G^\circ_f(\text{NH}_3) = -16.747 \text{ kJ/mol}, \quad \Delta G^\circ_f(\text{CH}_3\text{CHO}) = -133.978 \frac{\text{kJ}}{\text{mol}}$$

$$\Delta G^\circ_f(\text{H}_2\text{O}) = -228.600 \text{ kJ/mol}, \quad \Delta G^\circ_f(\text{C}_2\text{H}_5\text{OH}) = -174.883 \frac{\text{kJ}}{\text{mol}}. \quad \mathbf{8}$$

b) Derive an equation showing the effect of temperature on equilibrium constant. Using Vant Hoff equation predict the effect of increasing the temperature on endothermic and exothermic reactions. **8**

11. a) A gas mixture consists of 60% H_2 , 20% N_2 and the rest inert gas is passed

over a suitable catalyst for the production of ammonia $\frac{1}{2}\text{N}_2 + \frac{3}{2}\text{H}_2 \rightarrow \text{NH}_3$.

The equilibrium constant $K_p = 1.25 \times 10^{-2}$. The pressure is maintained at 50 bar. Assume ideal gas behavior for the gas mixture. Determine the composition of the gases leaving the reactor. **10**

b) Explain the phase rule and Duhems theorem for reacting systems. **8**

OR

12. a) For the cracking reaction $\text{C}_3\text{H}_8(\text{g}) \rightarrow \text{C}_2\text{H}_4(\text{g}) + \text{CH}_4(\text{g})$ the equilibrium conversion is negligible at 300 K but becomes appreciable at temperature above 500 K. For a pressure of 1 bar determine.

a) The fractional conversion of propane at 600 K.

b) The temperature at which the fractional conversion is 80%. **12**

b) Comment on multireaction equilibria. **6**



T.E. (Chemical) (Semester – II) Examination, 2011
CHEMICAL REACTION ENGINEERING – I
(2003 Course) (Common to Biotechnology)

Time : 3 Hours

Total Marks : 100

- Instructions :** 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

1. a) Discuss about molecularity order of reaction and rate constant. **6**
b) How kinetic model is tested ? Explain rules for matching the predicated rate expression and found experimentally. **6**
c) On doubling the concentration of the reactant the rate of reaction triples. Find the reaction order. **6**

OR

2. a) Write short note on elementary and nonelementary reactions. **6**
b) Explain temp dependent term of a rate equation and write comparison of theories with Arrhenius law. **8**
c) Milk is pasteurized if it is heated to 63°C for 30 min. but if it is heated to 74°C it only needs 15 sec. for the same result. Find the activation energy for this sterilization process. **4**

P.T.O.



3. a) Write equation and explain the test for second order reversible biomolecular reactions. 4

b) The aqueous reaction $A \rightarrow R+S$ proceed as follows :

Time, min	0	36	65	100	160	∞
C_A mol/lit	0.1823	0.1453	0.1216	0.1025	0.0795	0.0494

Given $C_{AO} = 0.1823$ mol/lit, $C_{RO} = 0$, $C_{SO} = 55$ mol/lit. Find the rate equation for this reaction. 12

OR

4. a) Write in detail reaction of shifting order for the reaction $A \rightarrow R$. 8

b) Liquid A decomposes by a first order kinetics and in a batch reactor 50% of A is converted in a 5 min run. How much longer would it take to reach 75% conversion ? 8

5. a) Derive the performance equation for recycle reactor. 12

b) One liter per minute of liquid containing A & B ($C_{AO} = 0.10$ mol/liter, $C_{BO} = 0.01$ mol/liter) flow into a mixed reactor of volume $V = 1$ liter. The materials react in a complex manner for which the stoichiometry is unknown. The outlet stream from the reactor contains A, B & C ($C_{At} = 0.02$ mol/lit, $C_{Bt} = 0.03$ mol/liter, $C_{Ct} = 0.04$ mol/liter). Find the rate of reaction of A, B and C for the conditions within the reactor. 4

OR

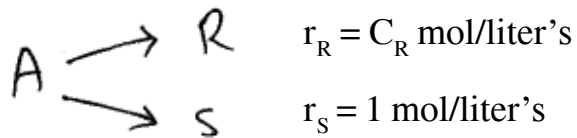
6. a) Explain the term space time and space velocity. 4

b) Describe the mixed flow reactors of different sizes in series, finding the conversion in a given system and determining the best system for a given conversion. 12

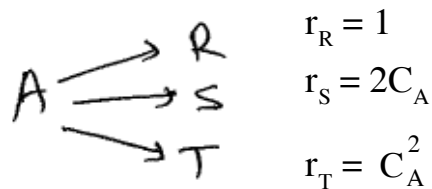


SECTION – II

7. In a reactive environment chemical A decomposes as follows :



For the feed stream $C_{A0} = 4$ mol/liter. What size ratio of two mixed flow reactor will maximize the production rate of R. Also give the composition of A and R leaving these two reactors. Consider the parallel decomposition of A of different orders.



Determine the maximum concentration of desired product obtainable in

- plug flow
- mixed flow.

18

OR

8. Reactant A decomposes in an isothermal batch reactor ($C_{A0} = 100$) to produce wanted R and unwanted S and the following progressive concentration reading are recorded.

C_A	100	90	80	70	60	50	40	30	20	10	0
C_R	0	1	4	9	16	25	35	45	55	64	71

Additional runs show that adding R or S does not affect the distribution of product formed and that only A does. Also it is noted that the total number of moles of A, R and S is constant.

- Find the Q versus C_A curve for this reaction with a feed of $C_{A0} = 100$, $C_{AT} = 10$, find C_R .
- From a mixed flow reactor
- From a plug flow reactor.

18



9. a) Determine the equilibrium conversion for the following elementary reaction between 0°C to 100°C $A \rightleftharpoons R$ at 298 K. $\Delta G = -14130$ J/mol, $\Delta H_R = -75300$ J/mol, $C_{PA} = C_{PR} = \text{constant}$.
- a) Construct a plot of temperature vs conversion. 12
- b) What restrictions should be placed on reactor operating isothermally if conversion of 85% or higher is desired.
- b) Discuss and draw general shape of temperature vs conversion plot of
- i) irreversible 4
- ii) reversible exothermic reaction.

OR

10. The concentrations as given in table represents a continuous response to pulse input into a closed vessel which is used as chemical reactor. Calculate mean residence time \bar{t} and construct E curve.

t (min)	0	5	10	15	20	25	30	35	
C_{pulse} g/lit Tracer output	0	3	5	5	4	2	1	0	16

11. a) With sketch, discuss in details the non-adiabatic operations. 8
- b) Explain the product distribution in PFR in series parallel reactions. 8

OR

12. Write a note on (**any three**) : 16
- a) Example of non-ideality in reactor
- b) Residence time distribution (RTD) and its relationship with F and C curve
- c) Optimum temperature progression
- d) Characteristics of tracer and RTD measurement.



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T.E. (Semester – II) (Chemical) (2003 Course) Examination, 2011
CHEMICAL PROCESS TECHNOLOGY

Time : 3 Hours

Max. Marks : 100

- Instructions :** A) 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.
- B) Answer to the **two** Sections should be written in **separate** books.
- C) **Neat** diagrams must be drawn **wherever** necessary.
- D) Figures to the **right** indicate **full** marks.

SECTION – I

- | | |
|--|-------|
| 1. 1) Describe the technology for the manufacture of Caustic soda and Chlorine as co-products with a flow diagram. | 8 |
| 2) Discuss the engineering problems involved in the above process. | 4 |
| 3) Which are the major technological/engineering problems involved in the manufacture of soda ash by Solvay process. | 4 |
| | <hr/> |
| | 16 |

OR

- | | |
|---|---|
| 2. 1) Write the basic conventions involved while drawing a flow diagram with one example. | 3 |
| 2) Define unit operation, unit process and write different types of unit operations and unit processes with one industrial application of each. | 5 |
| 3) Schematically represent the following Equipments (any 8) | |
| 1) Distillation column (batch and continuous) | |
| 2) Rotary dryer. | |
| 3) Cyclone Separator. | |
| 4) Shell and tube heat exchanger. | |

P.T.O.



- 5) Single and multiple effect evaporator.
- 6) Reboiler and Condenser.
- 7) Centrifugal pump
- 8) Wet scrubber
- 9) Rotary Filter
- 10) Crystallizer
- 11) Jet ejector
- 12) Fixed bed catalytic reactor. 8

16

3. Write short notes on **any three** of the following :

- 1) Mining of Sulfur by Frasch process
- 2) Production of ammonia by using nitrogen and hydrogen.
- 3) Triple superphosphates
- 4) Engineering problems involved in the urea manufacture from ammonium carbonate
- 5) conservation of sulfur. 18

OR

4. 1) With the help of a neat process flow diagram, describe the technology for the manufacture of sulfuric acid by contact process. 10
- 2) Discuss the major engineering problems associated in the above process. 3
- 3) Describe the wet process for the manufacture of phosphoric acid with the help of neat process flow diagram. 5

18

5. 1) With the help of a neat flow diagram describe the process for the manufacture of sugar from sugarcane. 10
- 2) Discuss the major engineering problems involved in the above process. 3
- 3) Write in short on the process for the manufacture of starch. 3

16

OR



- | | |
|--|-----------------|
| 6. 1) Describe the process for the manufacture of ethylalcohol and absolute alcohol from molasses by drawing a neat PFD. | 8 |
| 2) Define the term ‘Pulp’ and describe the sulfite process for the manufacture of pulp. | 4 |
| 3) Write the merits and demerits of sulfite and sulfate processes for the manufacture of pulp. | 4 |
| | <hr/> 16 |

SECTION – II

7. Write short notes on **any three** of the following :
- 1) High temperature carbonisation of coal.
 - 2) Hydrogenation of oil
 - 3) Chemistry involved in cleaning action of soaps and detergents.
 - 4) Importance of pharmaceutical industry.
 - 5) Working of coke oven and its industrial applications. **18**

OR

- | | |
|---|-----------------|
| 8. 1) Describe the technology for the manufacture of fatty acids, soap and glycerine by drawing a process flow diagram. | 10 |
| 2) What are the advantages of continuous hydrolysis saponification process overbatch process for the manufacture of soap. | 4 |
| 3) Write a note on industrial applications of soaps, detergents and glycerine. | 4 |
| | <hr/> 18 |
9. 1) Describe the process for the manufacture of producer gas and major engineering problems involved. **5**
- 2) Explain the term ‘Water gas’ and discuss the process for its manufacture along with technological / engineering problems involved. **8**
 - 3) Explain briefly how industrial gases are classified and their essential functions in our economy. **3**
- **16**

OR



10. 1) Define the term 'Petroleum' and how it occurs in nature. **2**
- 2) Write in short the composition of crude oil obtained from petroleum. **4**
- 3) Which are the fractions obtained from distillation of crude oil. **4**
- 4) Explain the following :
- Refining and types of refineries. **2**
 - Unit operations and conversion processes involved in refining. **4**
-
- 16**

11. Draw flow diagrams for the following processes (**any four**) :

- 1) Manufacture of methanol by using carbondioxide and hydrogen (synthesis gas)
- 2) Manufacture of Cumene by propylene alkyllation of benzene.
- 3) Production of phenol by oxidation of toluene
- 4) Production of phthalic anhydride by air oxidation of naphthalene or O-xylene.
- 5) Manufacture of formaldehyde from methanol.
- 6) Manufacture of acetone by dehydrogenation of isopropanol. **16**

OR

12. 1) Describe the technology for the manufacture of ethylene by steam cracking of petroleum hydrocarbons. **8**
- 2) Mention important industrial applications of ethylene and the industries manufacturing ethylene. **3**
- 3) Write the reactions involved in the manufacture of styrene by dehydrogenation of ethyl benzene and major engineering problems involved in the above process. **5**
-
- 16**



T.E. (Chemical) (Semester – II) Examination, 2011
MASS TRANSFER – II (Common to Biotechnology)
(2003 Course)

Time : 3 Hours

Max. Marks : 100

- Instructions :**
- 1) Answers to the **two** Sections should be written in **separate** answer books.
 - 2) **Neat** diagrams must be drawn **wherever** necessary.
 - 3) **Black figures** to the **right** indicate **full** marks.
 - 4) Your answer will be valued as a **whole**.
 - 5) Assume suitable data, if necessary.

SECTION – I

1. a) A bubble cap fractionating column of 12 plates working at an average efficiency of 75 % is being used to distill 1000 kg/hr of aqueous methanol at its bubble point enters the tower. The feed, overhead product and bottom product are 50 mole %, 90 mole % and 10 mole % methanol respectively. The total condenser is provided. The reflux is sent at its saturation temperature. If the reflux ratio is 1.7 times the minimum check whether the column available is satisfactory. The VLE data are

x_1	8	10	20	30	40	50	70	80	95
y_1	36.5	41.8	57.9	66.5	72.9	77.8	87.0	95.8	97.9

8

- b) Distinguish between extractive distillation and azeotropic distillation.

8

OR

2. a) A mixture of 35 mole % A and 65 mole % B is to be separated in a fractionating column. The concentration of A in the distillate is 93 mole % and 96 % of all product A is in the distillate. The feed is half vapour and the reflux ratio is to be 4.0. The relative volatility of A to B is 2.0. Calculate the number of theoretical plates in the column and locate the feed plate.

8

- b) Define differential distillation and derive Rayleigh equation.

6

- c) Define relative volatility.

2

P.T.O.



3. a) Nicotine - water solution containing 1 % nicotine by weight is to be extracted with kerosene at 293 K. The water and kerosene are essentially insoluble. Determine (i) The percentage extraction of nicotine if 100 kg of feed solution is extracted once with 150 kg of solvent (ii) repeat for three theoretical (ideal) extractions using 50 kg of solvent each time. The equilibrium data for extraction of nicotine expressed as kg nicotine per kg of liquid are as follows

12

$X = \frac{\text{kg nicotine}}{\text{kg water}}$	0	0.00101	0.00246	0.00502	0.00751	0.00998	0.0204
$Y = \frac{\text{kg nicotine}}{\text{kg kerosene}}$	0	0.00807	0.00196	0.00456	0.00686	0.00913	0.0187

- b) Write short note on effect of temperature and pressure on equilibrium diagram in liquid - liquid extraction.

6

OR

4. Picric acid is to be extracted from a dilute solution containing 0.1 mole picric acid per litre of solution using benzene as a solvent. 80 % of the original picric acid is to be recovered. The equilibrium data for benzene-picric acid - water system at 298 K are as follows

$C_S \times 10^2$	0.0932	0.225	1	2	5	10	18
$\frac{C_S}{C_A}$	2.23	1.45	1.705	0.505	0.32	0.24	0.187

where C_S and C_A are the equilibrium concentration of picric acid in mol/lit in benzene and aqueous phase respectively ? Determine the quantity of benzene required per 1 lit of aqueous solution for :

- single stage operation
- three stage cross current operation using equal quantities of fresh solvent in each stage.

18



5. a) Write material balance and minimum adsorbent requirement for multistage counter current operation. **12**
- b) Explain types of industrial adsorbents. **4**

OR

6. a) Experiments on decolorization of oil yielded the following equilibrium relationship $y = 0.5 x^{0.5}$

where $y = \text{gm of colour removed} / \text{gm of adsorbent}$

$$x = \text{colour in the oil, } \frac{\text{gm of colour}}{1000 \text{ gm of colour - free oil}}$$

100 kg oil containing 1 part of colour to 3 parts of oil is agitated with 25 kg of the adsorbent. Calculate the % of colour removed if

- a) all 25 kg adsorbent is used in one step
- b) 12.5 kg adsorbent is used initially, followed by another 12.5 kg of adsorbent. **12**
- b) Explain the nature of adsorbents. **4**

SECTION – II

7. a) Discuss in brief the factors affecting the rate of leaching. **4**
- b) Derive an expression for finding number of stages required in case of multistage counter current leaching. **12**

OR

8. a) Seeds containing 20 % by weight of oil are to be extracted in a countercurrent plant and 90 % of the oil is recovered in a solution containing 50 % by weight of oil. If the seeds are extracted with fresh solvent and 1.0 kg of solution is removed in the underflow in association with every 2.0 kg of insoluble matter, how many ideal stages are required ? **12**
- b) Define leaching with suitable examples. **4**



9. a) Write material and enthalpy balance of crystallization operation. **8**
- b) Describe with neat sketch of any two crystallizer. **8**

OR

10. a) A hot solution containing 5000 kg of Na_2CO_3 and water with a concentration of 25 % by weight Na_2CO_3 is cooled to 293 K and crystals of $\text{Na}_2\text{CO}_3 \cdot 10 \text{H}_2\text{O}$ are precipitated ; at 293 K the solubility is 21.5 kg anhydrous Na_2CO_3 per 100 kg anhydrous Na_2CO_3 per 100 kg of water. Calculate the yield of Na_2CO_3 crystals obtained if 5 % of the original water in the system evaporates on cooling. **12**
- b) Explain caking of crystals. **4**
11. a) Give classification of membrane processes. **6**
- b) Explain reverse osmosis with neat sketch. **6**
- c) State membrane material selection criteria. **6**

OR

12. a) Write different features for design of membrane system. **12**
- b) Give advantages of membrane separation over conventional processes. **6**