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# T.E. (Chemical) (Semester – II) Examination, 2010
# TRANSPORT PHENOMENA
## (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 electronic pocket calculator and steam tables is **allowed**.*
*6) Assume **suitable** data, if **necessary**.*

SECTION – I

1. Derive the equation of continuity in three dimensional co-ordinate, for a flow of a fluid through isothermal systems. **16**

OR

2. Deduce the velocity profile and momentum profile for a Newtonian fluid through a circular pipe inclined at an angle $\beta$. Find the ratio of maximum velocity to the average velocity. **16**

3. Derive Hagen-Poiseuille equation for flow through circular tube. **16**

OR

4. Water enters a boiler at 18.33 °C and 137.9 kPa through a pipe at an average velocity of 1.52 m/s. Exit stream at a height of 15.2 m above the liquid inlet leaves at 137.9 kPa, 148.9 °C and 9.14 m/s in the outlet line. At steady state, how much heat must be added per kg mass of steam ? Assume the flow in the two pipes as turbulent. **16**

5. Deduce the expression for a heat conduction in a cooling fin :

$$\eta = \frac{\tanh N}{N}$$ **18**

OR

6. An oil is acting as a lubricant for a pair of cylindrical surfaces. The angular velocity of the outer cylinder is 7908 rpm. The outlet cylinder has a radius of 5.08 cm and the clearance between the cylinder is 0.027 cm. What is the maximum temperature in the oil if both wall temperature are known to be 70°C. Assume cylindrical surfaces as of concentric type.

   The physical properties of oil are :

   Viscosity 92.0 cP, Density 1.22 $g.cm^{-3}$

   Thermal conductivity 0.0055 cal $sec^{-1}$ $°C^{-1}$. **18**

## SECTION – II

7. What are semiempirical expressions for turbulent energy flux and what are their applications ? **16**

   OR

8. Derive the expression for temperature distribution for the nuclear heat source stored at the centre in a spherical shell. What will be the maximum temperature ? **16**

9. Calculate the mass flux of benzene through a layer of air 10 mm thickness at 25°C and 200 $KN/m^2$ of total pressure. Partial pressure of benzene at the left side of the layer is $6\times10^3$ $N/m^2$ and 1 $KN/m^2$ at right side. The mass diffusivity at this temperature and pressure is $4.4\times10^{-6}$ $m^2/s$. **16**

   OR

10. If the rate of mass transfer is related to a characteristic concentration driving force $x_{A_1} - x_{A_2}$, for diffusion through a stagnent gas film, show that

$$N_{AZ/z=z_1} = \frac{C\,D_{AB}}{(Z_2 - Z_1)_{x_{Ben}}}(x_{A_1} - x_{A_2})$$ **16**

11. a) State and explain diffusion in laminar falling film. **8**

    b) Explain transfer coefficients at high mass transfer rates for film theory. **10**

    OR

12. A spherical drop of water, 0.005 cm in diameter is falling at a velocity of 215 $cm.s^{-1}$ through dry, still air at 1 atm pressure. Estimate the instantaneous rate of evaporation from the drop if the drop surface is at 21°C and air at 60°C. The vapor pressure of water at 21°C is 0.0247 atm. Assume pseudo steady state condition. **18**

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## T.E. (Mechanical) (Semester – I) Examination, 2010
## INDUSTRIAL ENGINEERING AND MANAGEMENT
## (2003 Course)

Time : 3 Hours Max. Marks : 100

***Instructions :*** *i)* ***All*** *questions are* ***compulsory****.*
*ii) Options are given within a question.*
*iii)* ***Use*** *separate answer sheet for* ***each*** *Section.*
*iv) Draw* ***neat*** *diagrams* ***wherever*** *necessary.*
*v) Assume* ***suitable*** *data, if* ***necessary****.*

SECTION – I

1. a) Explain the various techniques and tools used in industrial engineering. **8**

   b) Explain the relation between method study and productivity of a factory. **6**

   c) Write limitations of time study. **4**

   OR

   a) Compare method study and time study. **8**

   b) Following data refers to the time study carried in a machine shop. If relaxation and contingency allowances are 15% and 3% of normal time respectively, calculate standard time of the operation. **6**

| Element | Observed Time (min) | Performance Rating (%) |
|---|---|---|
| 1 | 1.29 | 85 |
| 2 | 2.13 | 90 |
| 3 | 0.18 | 80 |
| 4 | 3.57 | 95 |
| 5 | 2.97 | 85 |

   c) What are the criteria for qualified worker ? **4**

2. a) With the help of suitable examples explain the scope of Ergonomics. **8**

   b) What is Man-machine system ? Explain its important characteristics. **8**

   OR

**P.T.O.**

a) Explain the significance of Anthropometry. How it is useful in workplace design ? **8**

b) Explain the relationship between Ergonomics and safety. **8**

3. a) What is the necessity to calculate productivity of a certain production system ? How it is evaluated ? **8**

b) How Motivation will help to inhance the productivity of a company ? Explain Maslow's hierarchy of needs. **8**

OR

a) Explain the following concepts : **8**

i) Job Evaluation

ii) Merit Rating

b) Whether Management is an art or science ? Explain it with suitable justification. **8**

SECTION – II

4. a) What is importance of standard costing ? How it is calculated ? **8**

b) Explain the following concepts : **8**

i) Budgetary control

ii) Zero Based Budget (ZBB)

OR

a) Explain the concept of variance analysis. What are various types of variances ? **8**

b) Explain the following terms : **8**

i) Transfer pricing

ii) Responsibility accounting

5. a) Explain the importance of facility planning with reference to its elements like water, power, market, capital etc. **8**

b) Explain, "Material handling system is an important factor of an industry". **8**

OR

a) Explain the following layouts with their advantages and limitations : **8**

i) Line type layout

ii) Process type layout

b) Explain the principles of plant layout with suitable examples. **8**

6. a) Compare between MRP and JIT. **6**

b) What is selective inventory techniques ? Explain FSN analysis in brief. **6**

c) Discuss the important functions of production planning and control. **6**

OR

a) Explain in brief KANBAN production system. **6**

b) Discuss the importance of sales forecasting. Explain any one method of sales forecasting. **6**

c) A factory requires 12000 units per year. The cost of procurement and set-up is Rs. 80 and the cost of each unit is Rs. 6/-. If average inventory carrying cost is 15% of total inventory cost calculate :

i) Economical Order Quantity (EOQ)

ii) Total cost of inventory

iii) Frequency of production run if production capacity is 60 units per day. **6**

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## T.E. (Comp.) (Semester – I) Examination, 2010
## DIGITAL SIGNAL PROCESSING
## (2003 Course)

Time : 3 Hours 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**.*
*5) Attempt Q. **1** or Q. **2**, Q. **3** or Q. **4**, Q. **5** or Q. **6** from Section **I** and Q. **7** or Q. **8**, Q. **9** or Q. **10**, Q. **11** or Q. **12** from Section **II**.*

SECTION – I

1. A) Explain the sampling process in ADC and discuss the problem of identical sampling. **8**

   B) For a DT signal $x(n) = 2[u(n) - u(n-4)]$, obtain following resulting DT signals : **8**

   i) $x_1(n) = x(n-2) + \delta(n)$

   ii) $x_2(n) = x(n/2)$

   iii) $x_3(n) = x(-n) + x(n+3)$.

OR

2. A) State linearity and time invariant properties of a DT system and test it for a system – **8**

$$y(n) = x(n) - 2x(n-2)$$

   B) Obtain a linear convolution of two DT signals – **8**

$$x(n) = h(n) = 1, \quad -1 \le n \le +1$$

**P.T.O.**

3. A) Define ROC of Z-transform. Describe the ROC properties in detail. **8**

   B) Obtain inverse Z-transform using residue method where $X(Z) = \frac{Z}{(Z-1)^3}$. **8**

OR

4. A) State and prove following properties of Fourier transform i) Periodicity ii) Time Reversal. **8**

   B) Obtain ZT of a given DT signal using ZT properties where –
   $x(n) = 2nu(-n-1)$
   Sketch the ROC. **8**

5. A) Define system function H(Z). How it describes the properties of a DT system ? What is pole zero plot ? What do you mean by all pole and all zero system ? **10**

   B) Determine the impulse response of a system described as
   $y(n) + 3y(n-1) + 2y(n-2) = 2x(n) - x(n-1)$. **8**

OR

6. A) Obtain the frequency response of a system using simple geometric construction having impulse response – $h(n) = \{0.5, 0.5\}$. Obtain the difference equation of the system. **10**

   B) Draw a pole zero plot of a system described as –
   $y(n) = x(n) - x(n-1) + 0.2\ y(n-1) + 0.15\ y(n-2)$ what do you mean by multiple order poles/zeros ? **8**

## SECTION – II

7. A) Derive the first stage of DIF FFT algorithm. Draw the basic butterfly structure and obtain the computational complexity. **10**

   B) State and discuss the periodicity and symmetry property of N-point DFT. How can we compute N point circular convolution using DFT and IDFT ? **8**

OR

8. A) Draw a signal flow graph for N = 8 for DIT FFT algorithm. Explain In-place computation and Bit-reversal indexing features of the algorithm. **10**

   B) Obtain DT frequencies $\{W_k\}$ for 4-point DFT. For a DT sequence $x(n) = \{1, -2, 3\}$, obtain 4-point DFT using linear transformation matrix. **8**

9. A) Define a DT filter. Prove that for an ideal frequency response, $\infty$ number of filter coefficients are required. **8**

   B) Obtain corresponding DT filter using impulse invariance method from a CT filter having transfer function $H(s) = \frac{1}{s^2 + 3s + 2}$ with $F_s = 5$ sps. **8**

OR

10. A) Write algorithmic steps to design an FIR filter using Hanning window. Compare Hanning with rectangular window. **8**

    B) What is frequency warping effect in BLT method ? Write down the design steps of BLT method for IIR filters. **8**

11. A) Draw a functional block diagram of ADSP 21XX processor and briefly explain DAG and MAC functional blocks. **8**

    B) Explain linear phase FIR filter structure and draw it for filter length M = 5. **8**

OR

12. A) Obtain and realize direct and cascade form FIR filter structure for a system having –

$$h(n) = \{1, -3, 5, -3\}$$ **8**

    B) Obtain and realize direct form – II IIR filter structure for a system

$$H(z) = \frac{z^2 + \frac{1}{3}z}{z^2 - \frac{3}{4}z + \frac{1}{8}}$$

What is the advantage of this form over Direct Form – I structure ? **8**

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## T.E. (Computer Engg.) (Semester – II) Examination, 2010
## 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) Enlist and elaborate on the various functions of the manager in detail. **9**

   b) What is corporate planning ? Explain the essentiality of strategic planning. **8**

OR

2. a) What is the need of information systems ? What are the various components of information system ? **9**

   b) What is infrastructure management ? Why is it necessary for Information Technology (IT) industry ? **8**

3. a) Explain the applications of Management Information Systems (MIS) in : **9**

      i) Marketing management

      ii) Insurance sector

   b) Explain the importance of Management Information Systems (MIS) in the service industry. **8**

OR

**P.T.O.**

4. a) What is change management ? Explain the implementation challenges in change management. **9**

   b) Explain in detail the concept of Enterprise Application Integration. **8**

5. a) What are the steps in Business Process Re-engineering (BPR) ? Explain the value stream model of organization. **8**

   b) Explain in detail the components of Enterprise Management System (EMS). **8**

OR

6. a) Explain Voice BPO and non-voice BPO. What are the challenges in Business Process Outsourcing (BPO) management ? **8**

   b) What are the basic features of Enterprise Resource Planning (ERP) systems ? Explain the implementation steps of Enterprise Resource Planning (ERP) Systems. **8**

## SECTION – II

7. a) Explain the benefits, challenges and trends in Customer Relationship Management (CRM). **9**

   b) Explain with neat diagram, the electronic payment processes. **8**

OR

8. a) What is Supply Chain Management (SCM) ? Explain the role of Supply Chain Management (SCM) and give its benefits. **9**

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

      i) e-Commerce applications

      ii) B2B and B2C types of e-Commerce.

9. a) What is Decision Support System (DSS) ? Explain what-if analysis and Goal-seeking analysis using Decision Support System (DSS). **9**

   b) Explain the following : **8**

      i) Data-ware house architecture

      ii) Management of data-ware house

OR

10. a) Explain data mining for Decision Support System (DSS). What do you understand by Executive Information Systems ? **9**

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

    i) Applications of Artificial Intelligence

    ii) Knowledge based expert systems.

11. a) Explain the following : **8**

    i) Computer Crime

    ii) Software piracy

    b) Explain the ethical responsibilities of business professional. **8**

OR

12. a) Explain fault tolerant systems. What do you understand by contingency management ? **8**

    b) What are the major business drivers for global Information Technology (IT) ? Explain. **8**

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# T.E. (Computer) (Semester – II) Examination, 2010
## (2003 Course)
## SYSTEMS PROGRAMMING

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) Figures to the **right** indicate **full** marks.*
*5) Assume **suitable** data, if **necessary**.*

SECTION – I

1. a) What is language processor ? Explain various language processing tools. **8**

   b) With respect to the two pass assembler, which of the pass is responsible for the following activities
      i) Object code generation
      ii) Entry of literals into the literal table
      iii) Invalid mnemonic check
      iv) Address resolution of local symbols **4**

   c) Define :
      i) Assembler
      ii) Macro **2**

   d) 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 |

OR

2. a) Comment on the statement : "Programs with macros require more space at run time than program with functions". **4**

   b) Name the feature of macro that forces us to use stack. Explain in brief with the help of an example. **4**

   c) What feature of assembler makes it mandatory to design a two pass assembler ? Explain with the help of an example. **6**

**P.T.O.**

d) Comment on the following statements :

i) In certain cases Assembly language programming holds an edge over high level language programming.

ii) "Macros can not detect instructional errors i.e. errors in op-codes". **4**

3. a) What do you mean by overlay structure ? Discuss advantages of the same. **4**

b) Explain compile-and-go loader scheme. What are its advantages and disadvantages ? **8**

c) Compare .EXE and .DLL file. **4**

OR

4. a) Explain design of MS-DOS linker. **8**

b) What information must be provided by an assembler to the direct linking loader ? Explain significance of this information with respect to design of direct linking loader. **8**

5. a) Write an algorithm for lexical analyzer. **8**

b) Explain how to eliminate problem of left recursion and left factoring in top down parsing. **8**

OR

6. a) For the following program write output of Lexical analyzer. Show contents of all the tables. (in-built and generated)

```
main( )
{
    int a, b, c, d;
    a=10;
    b=20;
    c=a+b;
    d=c/a;
}
```

**8**

b) Explain Recursive descent parser with an example. **8**

SECTION – II

7. a) Compare multi-programming and time-sharing systems. **4**

   b) With the help of an example explain priority scheduling. What is starvation ? How to overcome this problem ? **8**

   c) For the following set of processes calculate average turn around time using FCFS scheduling. Also draw Gantt chart.

| Process | Arrival time | Burst time |
|---|---|---|
| P1 | 0.000 | 3 |
| P2 | 1.001 | 6 |
| P3 | 4.001 | 4 |
| P4 | 6.001 | 2 |

**4**

OR

8. a) For the following set of processes calculate average waiting time using preemptive shortest job first scheduling. Also draw Gantt chart.

| Process | Arrival time | Burst time |
|---|---|---|
| P1 | 0 | 8 |
| P2 | 1 | 4 |
| P3 | 2 | 9 |
| P4 | 3 | 5 |

**8**

   b) Describe the difference between short term, medium term and long term scheduling. **8**

9. a) Explain the need of demand paging. **8**

   b) What do you mean by compaction ? Explain with example. **8**

   c) What is page fault ? **2**

OR

10. a) Compare following :

    i) Internal and external fermentation

    ii) Logical and physical address **8**

    b) For the following reference string how many page faults will occur using LRU and optimal page replacement scheme. Compare the results. **10**

    1, 2, 3, 4, 5, 3, 4, 1, 6, 7, 8, 7, 8, 9, 7, 8, 9, 5, 4, 5, 4, 2

11.a) What are different file access methods ? Briefly discuss. **8**

    b) Suppose that a disk drive has 5000 cylinders, numbered 0 to 4999. The drive is currently serving a request at cylinder 143. The queue of pending requests in FIFO is :

    86, 1470, 913, 1774, 948, 1509, 1022, 1750, 130

    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**

OR

12. a) Compare linked and indexed allocation with example. **8**

    b) With example explain various free space management techniques. **8**

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## T.E. (Information Technology) (Semester – II) Examination, 2010
## SYSTEM SOFTWARE (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** 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) List the system programs which reside in the system permanently. Briefly explain each one of these stating the reason why they must reside permanently in system. **8**
   b) Explain the following language processor tools : **6**
      i) LEX ii) YACC
   c) Write the significance of debug monitor. **4**

OR

2. a) Explain the pass structure of a typical language processor. **8**
   b) Define the terms : **6**
      i) Language processor ii) Linker
      iii) Macro iv) Interpreter
   c) Compare the following : **4**
      i) Compiler and an Interpreter.
      ii) System program and application program.

3. a) What feature of assembler makes it mandatory to design a two pass assembler ? Explain with the help of an example. **6**
   b) For the following sample code show the output of PASS-I of two PASS assembler. Also show the entries of base register table.

```
SIMPLE   START    100
         BALR     15, 0
         USING    *, 15
LOOP     L        R1, TWO
         A        R1, FOUR
         ST       R1, FOUR
         CLI      FOUR +3, 4
         BNE      LOOP
         BR       14
R1       EQU      1
TWO      DC       F'2'
FOUR     DS       F
         END
```

   Assume : BALR and BR are of two bytes. L,A,ST,CLI,BNE are of four byte instructions. **10**

OR

**P.T.O.**

4. a) For the following input source, show the contents of various Macro definition table and Macro name table and Argument list array.

```
                START
                SR              2, 2
                L               1, DATA1
                MACRO
                ADD_MAIN        &ARG1
                L               1, &ARG1
                A               1, =F'10'
                SR              3, 3
                ST              1, &ARG1
                MEND
                AR              2, 2
                MACRO
                ADD_SECOND      &A1,&A2,&A3
                ADD_MAIN        &A1
                ADD_MAIN        &A2
                ADD_MAIN        &A3
                MEND
                ADD_MAIN        DATA1
                ADD_SECOND      X1, X2, X3
                ADD_SECOND      X2, X1, X3
DATA1           DC              F'20'
X1              DC              F'25'
X2              DC              F'30'
X1              DC              F'35'
                END
```

**12**

b) Comment on the statement: "Programs with macros require more space at run time than program with functions". **4**

5. a) With the help of examples, explain top-down parsing scheme. **8**

b) Enlist the various databases/data structures used in lexical analyzer. Give the format of each of these. **8**

OR

6. a) Consider the 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**

   b) Enlist the bottlenecks in topdown parsing. Briefly describe them. **8**

   c) What is lexical analysis ? **2**

SECTION – II

7. a) For the statement given below generate intermediate code in the format
   i) Quadruple ii) Triple iii) Parse Tree iv) Postfix Notation

   A = – P*(– Q + R) **8**

   b) Explain with the help of suitable examples.
   i) Common sub expression elimination
   ii) Dead code elimination. **8**

   c) With respect to the phases of compiler, state TRUE or FALSE :
   i) Memory allocation for an identifier is done by lexical analysis phase
   ii) Code generation phase can update Identifier table entries. **2**

OR

8. a) Explain in brief machine dependent optimization techniques. **4**

   b) Explain the term activation record and explain its use in storage allocation. **6**

   c) Write an algorithm for code generation for '+' operator. Clearly mention the assumptions made. **8**

9. a) In the default loading schemes, binding takes place at various points during the life of a process. Define the term "bind" and give example. **4**

   b) What point in time do each of the following loading schemes perform binding
   i) Absolute loader ii) Dynamic linking loader. **4**

   c) Explain with the help of flowchart, the design of an absolute loader. **8**

OR

10. a) 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**

    b) Enlist two advantages and disadvantages of binding at load time over binding at assembly time. **4**

    c) Briefly explain : Self relocating programs. **4**

11. a) Comment on the statements :
        i) "Printer drivers are all dynamic link libraries"
        ii) "Few dynamic link libraries are termed as *resource only*"
        iii) "Library files are used by the linker to resolve function calls in the source code"
        iv) "Call back functions are essentially address timer message" **8**

    b) Explain the term Dynamic Data Exchange. **8**

OR

12. a) What are the advantages and disadvantages of dynamic linking with import ? **4**

    b) Write short note on :
        i) Different methods of specifying link ii) Class Libraries **12**

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# T.E. (Mechanical) (Semester – II) Examination, 2010
## FLUID MACHINERY (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) **Use** of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is **allowed**.*

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

SECTION – I

**Unit – I**

1. a) What are hydrodynamic machines ? Explain different efficiencies of hydrodynamic machines. **8**

b) A jet of water coming out of 10 cm diameter nozzle strikes a moving blade with a velocity of 15 m/s horizontally and tangentially. The blade is also moving with a velocity of 5 m/s in same direction as that of jet. The blade is so shaped that the jet is deflected through 145°. Neglecting the friction loss over the surface of the blade, find the following :

i) Force exerted by the jet on the vane in the direction of its motion

ii) Power developed

iii) Efficiency of the blade. **8**

OR

2. a) A jet of water coming out from a nozzle of 2.5 cm diameter with a velocity 7.5 m/s strikes to hinged rectangular plate of 20 cm height whose point of action is 12 cm below the hinge.

   i) Determine the horizontal force required to be applied at the C.G. of the plate to maintain the plate in vertical position.

   ii) Find the required velocity of the jet if the plate is deflected through 25° to the vertical and the same force acts on the plate at its C.G. and along the same direction of original. The C.G. of the plate is 10 cm below the hinge and its weight is 60 N. **8**

   b) Show that when a jet of water impinges on a series of curved vanes, maximum efficiency is obtained when the vane is semi-circular in section and the velocity of the vane is half that at the jet. **8**

## Unit – II

3. a) With the help of neat sketch describe the main components of a pelton turbine. What are the limitations of a pelton turbine ? **8**

   b) A pelton wheel is operated by supplying water through a gross head of 500 m. The penstock carrying water from the dam to nozzle is 1m in diameter and 5 km long. The coefficient of friction for the penstock pipe is 0.008. The nozzle diameter supplying the water is 15 cm and it is deflected through 165° by the buckets. Because of friction, the velocity in the bucket passage is reduced by 15%. Find the power developed by the pelton wheel and brake power if the mechanical efficiency is 90%. Also find the hydraulic efficiency and over all efficiency. Take velocity ratio as 0.45. **8**

OR

4. a) Prove that the maximum hydraulic efficiency of a pelton wheel is given by $\eta_{hyd.max.} = \frac{1}{2} Cv^2[1 + k\cos\theta]$ where blade friction coefficient, $K = \frac{Vr_2}{Vr_1}$ and Cv is the coefficient of velocity. **8**

b) The following data refers to an outward flow impulse turbine

Inner diameter = 1.75 m

Outer diameter = 2 m

Speed = 300 rpm

No. of vanes = 30

Vane tip thickness = 2 cm at inlet, 3 cm at outlet

Supply head = 50 m

Width of runner = 25 cm at inlet, 20 cm at outlet

Flow rate = 6 $m^3/s$

Calculate moving vane angles at inlet and exit for a radial discharge at exit, if velocity of coefficient, Cv = 0.98. **8**

## Unit – III

5. a) Differentiate between inward radial flow and outward radial flow reaction turbine. Why inward radial flow reaction turbines are preferred in practice ? **6**

b) What is degree of reaction ? Explain its significance. **4**

c) A reaction turbine works at 450 rpm under a head of 115 m. The diameter of runner at inlet is 1.2 m and flow area of 0.4 $m^2$. At the inlet the absolute and relative velocities make angle of 20° and 60° respectively with tangential velocity. Determine runner power and hydraulic efficiency. Assume the velocity of whirl at the outlet to be zero. **8**

OR

6. a) What is cavitation ? On what factors does the cavitation in reaction turbines depend ? Explain the methods to avoid cavitations in water turbines. **9**

b) A conical draft tube attached to a francis turbine has an inlet diameter of 3 m and its area at exit of 20 $m^2$. Water enters the draft tube with a velocity of 5 m/s. The inlet of draft tube is 5 m above the tail race level. If the frictional loss in the draft tube is 5% of the velocity head at outlet, find :

i) Pressure head at inlet

ii) Total head at inlet considering tail race level as datum

iii) Power of water at exit of runner

iv) Power lost to tail race

v) Power lost in the draft tube. **9**

SECTION – II

**Unit – IV**

7. a) What do you understand by characteristic curves of a turbine ? Discuss different operating characteristic curves for reaction turbines. **8**

b) The following data refers to a turbine at 200 rpm with full gate opening :

| **Head M** | 7.5 | 6.78 | 6.18 | 5.67 | 5.22 | 4.8 |
|---|---|---|---|---|---|---|
| **Power KW** | 266 | 231 | 201 | 176 | 153 | 131 |
| **Efficiency %** | 81.1 | 83.1 | 84.4 | 84.6 | 85.0 | 84.1 |

Draw graph of unit power and efficiency against unit speed. How much water is required per second for maximum output under a head of 6.3 m ? **10**

OR

8. a) A francis turbine of diameter 3 m develops 7000KW at 300rpm when the head available is 50 m. A model of scale 1 : 8 is to be tested in the laboratory where the head available is 10 m. Find the size, speed, discharge and power developed by the model. Assume overall efficiency for both is 0.8. Also find specific speed for both. **8**

b) Derive on expression for specific speed of a water turbine. What is its effect on the shape of runner in the water turbine ? **5**

c) Define specific speed of a pump and explain its importance particularly for model testing. **5**

## Unit – V

9. a) What is cavitation and causes for creating the cavitation in centrifugal pump ? Explain the effects of cavitation and methods of its preventation. **8**

b) A centrifugal pump is coupled with diesel engine and running at 1000 rpm. The water enters the pump radially and the velocity of flow is constant through the impeller. The inside and outside diameters of the pump are 20 cm and 40 cm respectively. The inlet and exit blade angles are 20°C and 30°C. Width of the vane at inlet is 2cm. Take overall efficiency as 70% and mechanical efficiency as 90%. Neglecting losses and blade thickness, calculate discharge through the pump and power input given by the diesel engine. **8**

OR

10. a) The following table gives head discharge characteristics of a centrifugal pump at constant speed.

| **'Q' lpm** | 0 | 200 | 400 | 600 | 800 | 1000 | 12000 |
|---|---|---|---|---|---|---|---|
| **'H' m** | 15 | 14.6 | 13.2 | 11.0 | 8.4 | 7.2 | 5.8 |
| **%η** | 0 | 46 | 71 | 78 | 70 | 62 | 50 |

Two such pumps are connected in parallel with common suction and delivery pipes to operate against a static lift of 7.5 m. The frictional external losses to the pump are given by $2.05Q^2 \times 10^{-6}$ m where 'Q' is the discharge in lpm. Calculate the discharge, head and power required to drive the pumps when :

i) Only one pump is operated

ii) Two identical pumps are operated in parallel. **16**

## Unit – VI

11. a) Explain construction and working of a hydraulic torque converter with the help of neat sketch. **8**

b) A hydraulic ram delivers water at the rate of 5 litres/sec to a tank located at 40 m from the ram. The water is supplied to the ram from a tank of 5 m height from ram at a rate of 50 litres/sec. The length and diameter of the delivery pipe are 60 m and 6 cm respectively. Find the D'Aubuisson and Ronkine efficiencies of the ram. Take F = 0.01 for delivery pipe. **8**

OR

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

i) Airlift pump

ii) Regenerative pump

iii) Deep well pump

iv) Fluid coupling.

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**[3863] – 25**

# T.E. (Mech. S/W) (Semester – II) Examination, 2010
## 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

1. a) What are the required properties of an ideal refrigerent ? **4**

   b) What refrigerants are used and what factors are considered in selecting a refrigerant for following purposes ? **6**

      i) Ice production factory ii) Home refrigeration

   c) In an open type of refrigerating installation, 1000 kg of atmospheric air are circulated per hour. The air is drawn from cold chamber at temperature 7°C and 1 bar and then compressed isentropically to 5 bar. It is cooled at this pressure to 27°C and then led to the expander where it expands isentropically down to atmospheric pressure and is discharged to cold chamber. Find out : **6**

      i) Heat extracted from cold chamber per hour

      ii) Heat rejected to cooling water per hour

      iii) COP of system

      Take for air $\gamma$ = 1.4 and Cp = 1.0 kJ/kg°K.

OR

**P.T.O.**

2. a) Draw a neat sketch of ammonia absorption refrigeration system and explain its working. **6**

b) An ammonia refrigeration system produces 15 tons of ice from and at 0°C in a day. The temperature range of the working cycle is 25°C and –15°C. The ammonia vapor is dry and saturated at the end of compression. Assume actual COP is 55% of theoretical. Calculate : **10**

i) the power required to drive the compressor

ii) mass flow rate in kg/min

Take latent heat of ice = 335 kJ/kg and Cp(water) = 4.2 kj/kg°k. Use following properties of ammonia.

| **Temperature (°C)** | **Specific enthalpy kJ/kg** | | **Specific entropy kJ/kg °k** | |
|---|---|---|---|---|
| | **liquid** | **vapor** | **liquid** | **vapor** |
| 25 | 380.74 | 1319.21 | 0.3473 | 4.4894 |
| –15 | –54.56 | 1304.99 | – 0.2134 | 5.0585 |

3. a) Define the term ‘by-pass factor’ used for cooling or heating coil and derive the expression for the same. **6**

b) Explain the following terms : **4**

i) Degree of saturation ii) DPT

c) The DBT and WBT of air are 35°C and 23°C respectively when barometers reads 75 cm of Hg. Find : **6**

i) Relative humidity

ii) Specific humidity

iii) DPT

iv) Density

v) Enthalpy

Use Psychrometric relations only.

OR

4. a) Draw a neat diagram of air conditioning system required in winter season. Explain the working of different components in the circuit. **5**

b) Define comfort and explain the factors which affect comfort. **3**

c) An air conditioning plant is required to supply 60 $m^3$ of air per minute at a DBT of 21°C and 55% RH. The outside air is at DBT of 28°C and 60% RH. Determine the mass of water drained and capacity of cooling coil. Assume the air conditions plant to dehumidify and then cool the air. Use psychrometric chart. **8**

5. a) Mention the important applications of compressed air. **4**

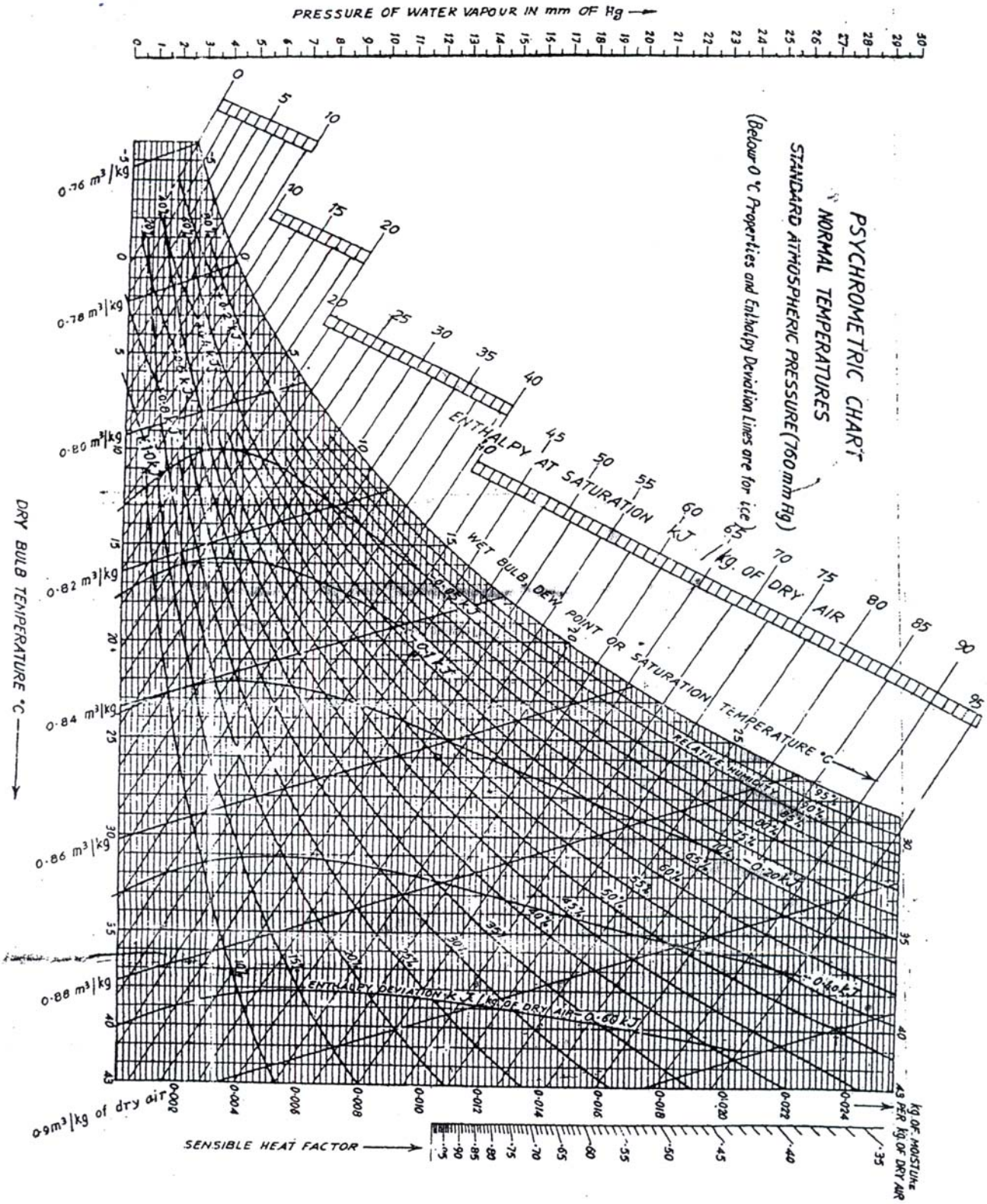
   b) Classify the various types of air compressor and explain. **6**

   c) A two stage, single acting air compressor takes air at 1.01325 bar and 288°k and delivers at 9 bar with a rate of 4.5 kg/min when runing at 300 rpm. Considering perfect intercooling and assuming the compression and expansion in both stages follow the law $PV^{1.3} = c$, determine i) Indicated power ii) The cylinder swept volume. Assume clearance is 5% of swept volume in both stages. **8**

OR

6. a) Describe the fields of applications of centrifugal and axial flow compressors. Explain why now a days axial flow compressors are largely used for aviation gas turbines. **8**

   b) Free air of 20 $m^3$/min is compressed from 1 bar to 2.2 bar. Find 1) the I.P. required if the compression carried out in roots blower 2) if the compression is carried out in vane blower. Assume that there is 25% reduction in volume before the back flow occurres and 3) isentropic efficiency in each case. **10**


PSYCHROMETRIC CHART
NORMAL TEMPERATURES
STANDARD ATMOSPHERIC PRESSURE (760 mm Hg)
(Below 0 °C Properties and Enthalpy Deviation Lines are for ice)
PRESSURE OF WATER VAPOUR IN mm OF Hg
ENTHALPY AT SATURATION KJ / kg. OF DRY AIR
WET BULB DEW POINT OR SATURATION TEMPERATURE °C
DRY BULB TEMPERATURE °C
RELATIVE HUMIDITY
ENTHALPY DEVIATION KJ / kg OF DRY AIR
SENSIBLE HEAT FACTOR
kg OF MOISTURE PER kg OF DRY AIR
m³/kg of dry air

SECTION – II

7. a) Explain the stages of combustion in SI engine. **6**

   b) Discuss the effect of following variables on detonation :

      i) Engine speed

      ii) Turbulence

      iii) Spark timing. **6**

   c) What are the basic requirements of good SI engine combustion chamber. **4**

OR

8. a) Compare diesel knock and detonation in SI engine with the help of $P - \theta$ diagram. **6**

   b) Compare induction Swirl and compression Swirl. **6**

   c) Explain cetane number. **4**

9. a) Explain thermodynamic cycle of supercharged engine. **6**

   b) What is meant by pulse turbocharging ? What are its advantages and disadvantages ? **6**

   c) Explain limits of turbocharging. **4**

OR

10. a) Explain what is crankcase blowby ? How it can be controlled ? **6**

    b) Describe with sketches following methods of petrol exhaust emission control : **6**

       i) After burner

       ii) Exhaust manifold reactor.

    c) Compare diesel engine and gasoline engine emission. **4**

11. a) Explain with neat sketch open cycle gas turbine with regeneration. **6**

    b) Give classification of gas turbines. **4**

    c) A gas turbine unit receives air at 1 bar and 300 k and compresses it adiabatically to 6.20 bar. The compressor efficiency is 88%. Fuel has heating value of 44186 kj/kg and fuel air ratio is 0.017 kg of fuel/kg of air. Turbine internal efficiency is 90%. Calculate the work of turbine and compressor per kg of air compressed and thermal efficiency. For air Cp = 1.005 kJ/kgk. V = 1.4, $Cp_g$ = 1.147 kJ/kgk, and V = 1.333. **8**

OR

12. a) Explain with neat sketch turbojet engine. **6**

    b) Explain solid propellant rocket engine. **4**

    c) Air enters at the rate of 900 kg/min into a compressor of jet aircraft travelling at 241 m/sec. The air fuel ratio is 60 : 1 and compression pressure ratio is 6 : 1. The calorific value of fuel is 41820 kJ/kg. Neglecting all losses calculate the thrust, specific fuel consumption and propulsive efficiency. **8**

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**[3863] – 26**

## T.E. (Mechanical S/W) (Semester – II) Examination, 2010
## THEORY OF MACHINES AND MACHINES DESIGN – II
## (2003 Course)

Time : 4 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 terms : Function generation, path generation and motion generation. **6**

b) Fig. 1 shows a schematic of a four bar mechanism with input link 'a' and out put link 'c' angles $\theta$ and $\phi$ for three successive positions are given in the table below :

| | 1 | 2 | 3 |
|---|---|---|---|
| $\theta$ | 55 | 25 | – 25 |
| $\phi$ | 110 | 40 | – 50 |

If the length of grounded link is 40 mm, using Freudenstein's equation, find out other link lengths to satisfy the given positional conditions. Draw the synthesized mechanism in its second position. **10**

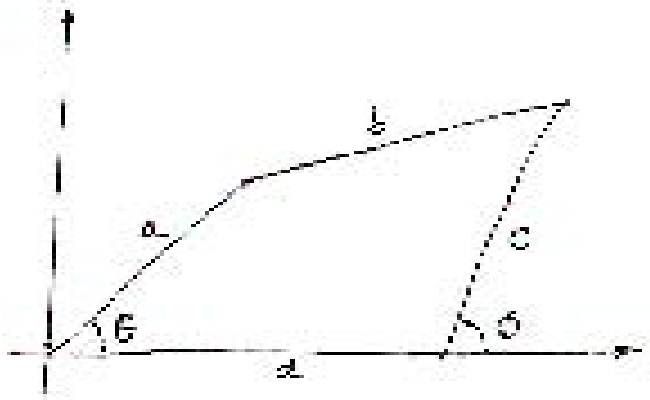


Fig. 1

OR

2. A disc cam rotating in a clockwise direction is used to move a reciprocating roller with simple harmonic motion during rise and cycloidal motion during return as below :

   i) Outstroke with maximum displacement of 40 mm during 120° of cam rotation

   ii) Dwell for 60° of cam rotation

   iii) Return stroke during 90° of cam rotation and

   iv) Dwell during remaining 90° of cam rotation.

   The line of reciprocation of follower is offset by 20 mm towards right from the cam shaft axis. If the cam rotates at a uniform speed of 300 rpm, find the maximum velocity and acceleration during outstroke and return stroke. The roller diameter is 20 mm. **16**

3. a) Two mating gears have 20 and 40 involute teeth of module 10 mm and 20° pressure angle. The addendum on each wheel is to be made of such a length that the line of contact on each side of the pitch point has half the maximum possible length. Determine the addendum height for each gear wheel, length of the path of contact, arc of contact and contact ratio. **10**

   b) Derive an expression for virtual number of teeth for helical gear. **6**

OR

4. a) An epicyclic gear consists of three gears A, B and C as shown in Fig. 2. The gear A has 72 internal teeth and gear C has 32 external teeth. The gear B meshes with both A and C and is carried on an arm EF which rotates about the centre of A at 18 rpm. If the gear A is fixed, determine the speed of gears B and C. **8**

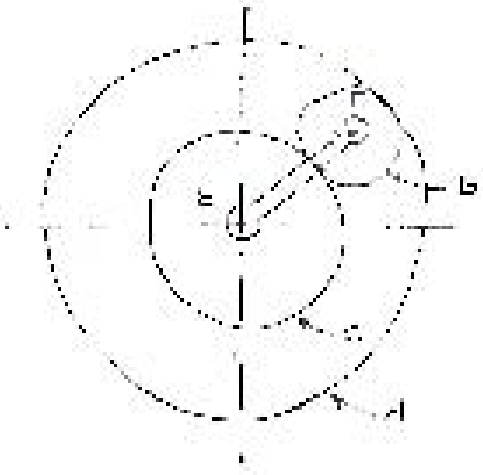

Fig. 2

b) Define the following terms in case of a worm gear with neat sketch - i) axial pitch ii) lead and lead angle. **6**

c) Show various forces acting on the tooth of a bevel gear. **2**

5. a) A cone clutch having 30° cone angle is required to transmit 25 kW at 2000 rpm. The width of face is one third of mean radius. The coefficient of friction is 0.2 and the pressure is limited to 3 bar. Assuming uniform wear condition, find the axial load and the main dimensions of the clutch. **8**

b) Explain the working of prony brake dynamometer and epicyclic train dynamometer with neat sketch. **10**

OR

6. a) A band and block brake is lined with 12 equal block 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 the lever at a distance of 400 mm from the fulcrum to absorb 200 kW at 25 rad/sec. **8**

b) Explain working of centrifugal clutch with neat sketch. **6**

c) Give the classification of dynamometers along with application of each. **4**

## SECTION – II

7. a) A gear drive is required to transmit a maximum power of 22.5 kW. The velocity ratio is 1 : 2 and pinion rotates with 200 rpm. The approximate centre distance between the shafts may be taken as 600 mm. The teeth are 20° stub involute profiles. The static stress for the gear material (which is cast iron) may be taken as 60 MPa and face width as 10 times the module. Find the module, face width and number of teeth on each gear.

Check the design for dynamic and wear loads. The deformation or dynamic factor in the buckingham eq$^{n}$ may be taken as 80 and material combination factor for wear as 1.4.

Data :

i) Velocity factors :

a) For $v < 10$ m.sec, $cv = \frac{3}{3+v}$

b) For $v < 20$ m/sec. $cv = \frac{6}{6+v}$

ii) Lewis form factor :

$Y = 0.175 - \frac{0.841}{T}$, for 20° stub system. **12**

b) Derive an expression for stiffness of the springs connected in series. **4**

OR

8. a) It is required to design a helical compression spring with square and ground ends, for carrying a maximum load of 2750 N to minimum load of 2250 N. The axial deflection of the spring for the load range is 6 mm. Assume a spring index of 5. The permissible shear stress intensity is 420 MPa and modulus of rigidity $G = 84$ kN/mm$^2$.

Neglect the effect of stress concentration. Draw a fully dimensioned sketch of the spring showing details the finish of the end coils. **8**

b) Derive an expression for virtual number of teeth on a helical gear. **8**

9. a) The effective turning moment exerted by a two stroke engine at crank is represented by

$$T = 8000 + 1000 \sin 2\theta - 2000 \cos 2\theta, \text{ N – m}$$

where $\theta$ is the inclination of the crank to the IDC. The cycle repeats after every 180° of crank rotation. Assuming an external resistance constant, determine the mass and cross section of the flywheel. The width of the rim is four times the thickness. Also find the power developed by the flywheel.

Assume total % fluctuation of speed as 0.8% of mean speed of 300 rpm, $\rho = 7200$ kg/m$^3$. From space constraints, the flywheel radius should not exceed 750 mm. **10**

b) What are the design considerations in design of a friction clutch. **6**

OR

10. a) A centrifugal clutch is to be designed to transmit 15 kW at 900 rpm. The shoes are four in number. The speed at which the engagement begins is $\frac{3}{4}^{th}$ of the running speed. The inside radius of the pulley rim is 150 mm. The shoes arc lined with Ferrodo for which the coefficient of friction may be taken as 0.25. Determine mass and size of the shoes. **8**

b) Derive an expression for maximum fluctuations of energy stored in a flywheel. **6**

c) Explain different types of stresses induced in a flywheel rim. **2**

11. a) Explain design procedure for journal bearing. **6**

b) A transmission shaft rotating at 720 rpm and transmitting power from pulley P to spur gear G is shown in Fig. 3. The belt tensions and the gear tooth forces are as follows

$T_1$ = 498 N, $T_2$ = 166 N

$P_t$ = 497 N $P_r$ = 181 N.

The weight of the pulley is 100 N. The diameter of the shaft at bearing $B_1$ and $B_2$ is 10 mm and 20 mm respectively. The load factor is 2.5 and the expected life for 90% of the bearings is 8000 hrs. Select single row deep groove ball bearings at $B_1$ and $B_2$. **12**

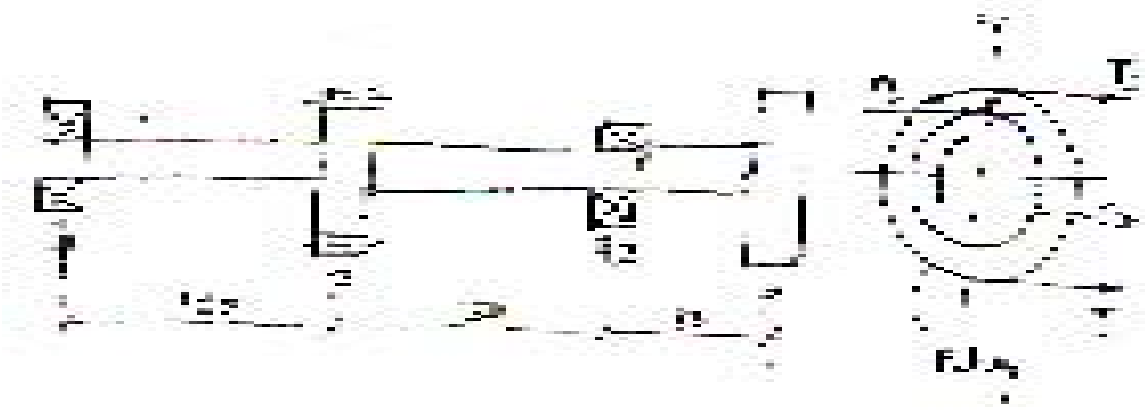

Fig. 3

Table 1 : Static and dynamic load capacities of single row deep groove ball bearings.

| Shaft diameter | Static capacity (N) | Dynamic capacity (N) | Designation |
|---|---|---|---|
| 10 mm | 1480 | 630 | 61800 |
| | 4620 | 1960 | 6000 |
| | 5070 | 2240 | 6200 |
| | 8060 | 3750 | 6300 |
| 20 mm | 2700 | 1500 | 61804 |
| | 7020 | 3400 | 16400 |
| | 9360 | 4500 | 6004 |
| | 12700 | 6200 | 6204 |
| | 15900 | 7800 | 6304 |
| | 30700 | 16600 | 6404 |

OR

12. a) Derive stribeck equation for static load carrying capacity of roller bearings. **8**

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

Radial load = 3.2 kN

Journal diameter = 50 mm

Bearing length = 50 mm

Journal speed = 1490 rpm

Radial clearance = 50 $\mu$m

Viscosity of lubricant = 25 cp

Density of lubricant = 860 kg/$m^3$

Specific heat of lubricant = 1.76 kJ/kg°C

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

i) minimum oil film thickness,

ii) coefficient of friction,

iii) power lost in friction,

iv) the total flow rate of lubricant in $\mu$min,

v) side leakage. **10**

| $\left(\frac{l}{d}\right)$ | $\varepsilon$ | $\left(\frac{h^\circ}{c}\right)$ | S | $\phi$ | $\left(\frac{r}{c}\right)f$ | $\frac{\alpha}{rcn_s l}$ | $\frac{\phi}{\alpha s}$ |
|---|---|---|---|---|---|---|---|
| 1.0 | 0.4 | 0.6 | 0.264 | 63.10 | 5.79 | 3.99 | 0.497 |
| | 0.6 | 0.4 | 0.121 | 50.58 | 3.22 | 4.33 | 0.680 |
| | 0.8 | 0.2 | 0.0446 | 36.24 | 1.70 | 4.62 | 0.842 |

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**T.E. (Production/Prod./Sandwich) (Semester – I) Examination, 2010**
**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) Data obtained from an orthogonal cutting operation is :

   Cutting speed of 20 m/min, rake angle of a tool a 25 degree, uncut chip thickness 0.1 mm, cut chip thickness 0.25 mm, cutting force is 800 N and feed force 250 N,

   Calculate :

   i) Shear plane angle, ii) shear strain, iii) coefficient of friction at tool rake face, iv) friction force on the rake face, v) power required for cutting. **10**

   b) Sketch and explain Merchant's circle of cutting force. **6**

   c) Explain the ORS system of tool signature. **4**

OR

2. a) Explain the mechanism of chip formation. Why different types of chips produced during metal cutting ? **6**

   b) Enumerate the factors affecting drilling torque and thrust. **6**

   c) Show that during orthogonal machining with zero rake angle tool the shear strain is given by $e = \frac{1 + r^2}{r}$ r = Chip thickness ratio. **8**

**P.T.O.**

## Unit – II

3. a) Write a short note on :
   i) Cutting tool material, ii) Heat treatment of tools. **10**

   b) Explain with neat sketch Kolesov and Gaussion tool. **5**

OR

4. a) What are different grades of carbides ? Explain it. **7**

   b) Draw two views of a plain milling cutter and show different angles and label important elements of it. **8**

## Unit – III

5. a) Explain the following types of tool wear stating the main reasons
   i) Abrasive wear, ii) Adhesive wear, iii) Diffusion wear. **9**

   b) Write a short note on Heat affected zone in metal cutting and explain how mechanical properties of work piece and tool material affect the cutting temperature. **6**

OR

6. a) In a turning operation, it was observed that tool life was 120 minutes when the cutting speed was 20 m/ min. As the cutting speed was increased to 30 m/ min, the tool life decreased to 50 min. If the time required to change the tool was 2 minutes and if the cost of regrinding the tool was ten times the cost of turning per minutes, Calculate :
   i) The most economical cutting speed
   ii) Tool life for maximum production. **7**

   b) What are the function of cutting fluids and explain with sketches the methods of applications of cutting fluids. **8**

SECTION– II

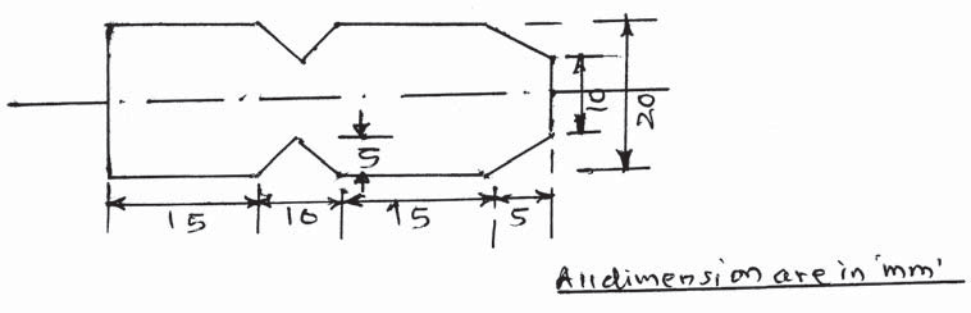
## Unit – IV

7. a) With neat diagram explain the elements of a twist drill. **7**

   b) Draw a sketch to show various elements of a broach and discuss the considerations in the design of broach. **8**

OR

8. a) Design a circular form tool for the following job, Rake angle = 12°, relief angle = 10° Minimum chi disposal thickness = 5 mm. **8**




b) Explain the design procedure of a turning tool. **7**

## Unit – V

9. a) Discuss the principle of perpendicular locating planes. **5**

b) Write a short note on : **10**

i) Box type jig,

ii) Boring fixture

OR

10. a) Explain different types bushes with neat sketches. **8**

b) Explain with suitable sketch the use of Diamond pin locator, how the dimension of Diamond pin is calculated. **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 mill at face A and B to maintain dimension $64^{+0.0}_{-0.1}$ mm for a component shown in fig. no. 1. **20**

    Draw minimum two views of your design, show the component in position, and name all important elements in drawing, write a part list of your design and draw detail view for locating, clamping, and bushing.

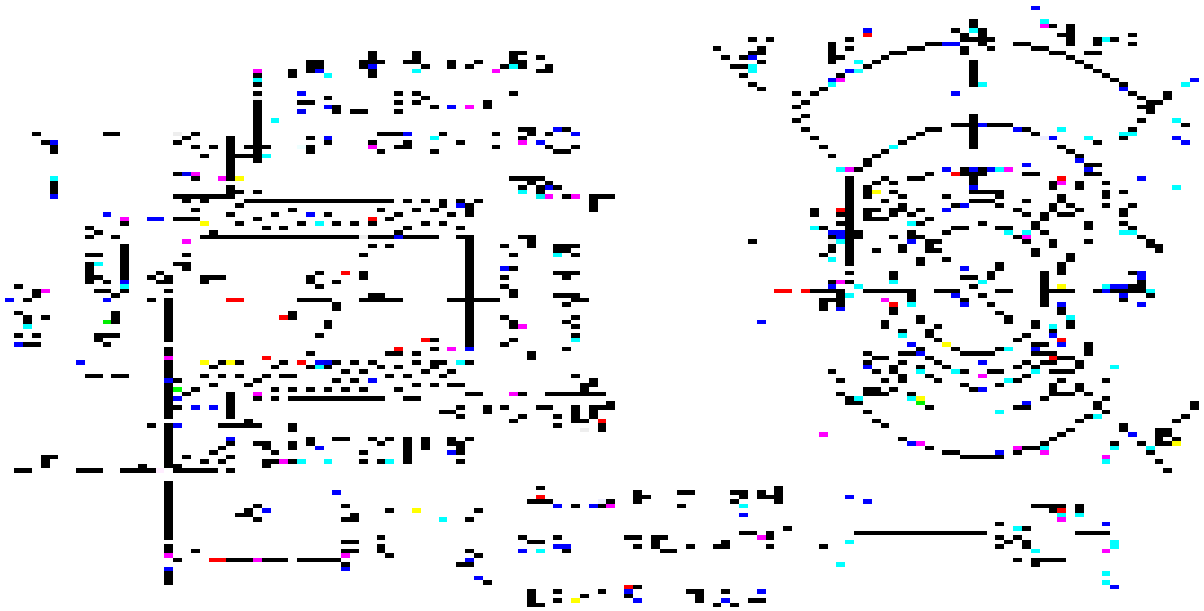


Fig. No. 1

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# [3863] – 62

## T.E. (Electrical) (Semester – I) Examination, 2010
## ELECTRICAL MACHINES – II
## (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**.*

*2) Answer Q. No. **7** or **8**, Q. No. **9** or **10**, Q. No. **11** or **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 and electronic pocket calculator is **allowed**.*

SECTION – I

1. a) Prove by analytical method that when 3-phase balanced currents are fed to a 3-phase wound (balanced) stator of induction motor, 3-phase rotating field is produced. Give the frequency of such field and its magnitude. **8**

   b) A 3-phase, 6 pole, 50 Hz induction motor has a slip of 1% at no load and 3% at full load.

   Determine :

   a) synchronous speed

   b) no-load speed

   c) full-load speed

   d) Frequency of rotor current at standstill

   e) Frequency of rotor current at full load. **8**

OR

**P.T.O.**

2. a) Explain how a slip ring induction motor differs in construction, application and starting method with respect to cage induction motor. **6**

   b) Derive an expression for torque of a 3-phase induction motor and obtain the condition for maximum torque. **6**

   c) A 746 KW, 3-phase, 50 Hz, 16-pole induction motor has a rotor impedance of (0.02 + j 0.15) $\Omega$ at standstill. Full load torque is obtained at 360 r.p.m.

   Calculate :

   a) the speed at which maximum torque occurs

   b) the ratio of maximum to full load torque. **4**

3. a) What are the various losses occurs in a 3-phase induction motor ? Mention where they occur. Describe a method for separation of friction and windage losses from the no load losses of the motor. **6**

   b) Derive a relationship between rotor input power, rotor copper loss and power developed at shaft of a 3-phase induction motor. **6**

   c) The stator loss of a 3-phase induction motor is 2 KW. When the power input is 90 KW, what will be the rotor mechanical power developed and the rotor copper loss if the motor is running with a slip of 4%. **6**

OR

4. a) Draw the equivalent circuit of a 3-phase induction motor. Describe a method to determine the various parameters of the equivalent circuit in the laboratory. **8**

   b) A 50 KW, 6 pole, 50 Hz, 450 volts, 3-phase slip-ring induction motor furnished the following test figures :

   No-load test : 450 V, 20 A, p.f. = 0.15

   Blocked rotor test : 200 V, 150 A, p.f. = 0.3

   The ratio of stator to rotor copper losses on short circuit was 5 : 4. Draw the circle diagram and determine from it,

   a) the full-load current and power factor

   b) maximum torque

   c) slip at full load

   d) efficiency at full load.

   Take a current scale of 1 cm = 15 A. **10**

5. a) Describe the performance of a star delta starter and a direct on line starter with the help of connection diagrams. **8**

   b) A cage induction motor when started by means of a star-delta starter takes 180% of full load line current and develops 35% of full load torque at starting. Calculate the starting torque and current in terms of full load values, if an auto-transformer with +5% tapping were employed. **8**

OR

6. a) Draw the equivalent circuit of a double cage induction motor. Sketch torque-slip characteristics of such motor. **4**

   b) Compare a single cage and double cage induction motor of the same rating. **4**

   c) The standstill impedance of the outer cage of a double-cage induction motor is $(0.3 + j\ 0.4)\Omega$ and that of the inner cage is $(0.1 + j\ 1.5)\Omega$. Compare the relative currents and torques of the two cages a) at standstill b) at a slip of 5%. Neglect stator impedance. **8**

SECTION – II

7. a) Explain the phenomena of cogging, crawling and noise production in a 3-phase induction motor. **6**

   b) Explain v/f method for speed control of 3-phase induction motor. **6**

   c) What are the various methods of braking of a 3-phase induction motor ? Explain any one method with a circuit diagram. **6**

OR

8. a) List various tests to be performed on 3-phase induction motor as per Indian standards. Explain any two such tests with the help of connection diagrams. **6**

   b) Explain the working of a rotor fed 3-phase induction motor. **6**

   c) Explain construction, principle of working of 3-phase induction voltage regulator. **6**

9. a) Using double revolving field theory, explain why a single phase induction motor is not self starting ? Hence draw it's torque-slip characteristics for both forward and backward running motor. **8**

   b) Draw the circuit diagram of a capacitor-start capacitor-run single phase induction motor and explain its working. Where this type of motor is commonly used ? **8**

OR

10. a) Discuss the procedure for determining the parameters of equivalent circuit of a single-phase induction motor. **8**

    b) Explain the construction and working of a shaded-pole motor. **8**

11. a) What do you mean by transformer and rotational e.m.f.s ? Write down their expressions only as produced in the field winding and the armature winding of a single phase A.C. series motor. **6**

    b) How torque is produced in a single phase A.C. series motor ? Explain with the help of a schematic diagram. **6**

    c) What are compoles ? Discuss various types of compoles commonly used in a A.C. series motor. **4**

OR

12. a) Draw the circle diagram of a universal motor and indicate on it various performance parameters of the motor. Prove analytically or otherwise the performance parameters eg. full load torque, output and speed at full load. **8**

    b) A universal series motor has a resistance of 30 $\Omega$ and an inductance of 0.5 H. When connected to a 250 V dc supply and loaded to take 0.8 A it runs at 2000 rpm. Determine the speed, torque and power factor when connected to a 250 V, 50 Hz ac supply and loaded to take the same current. **8**

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**[3863] – 68**

# T.E. (Electrical) (Semester – II) Examination, 2010
## 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) You are advised to attempt **not** more than **six** questions.*
*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) Draw V-I characteristic of SCR. Define and explain importance of holding current and latching current. **6**

   b) State the difference between line commutation and forced commutation of $SCR^S$. Compare class B with class D commutation method of SCR. **6**

   c) For an SCR, gate cathode characteristic has a straight-line slope of 130. For trigger source voltage of 15 V and allowable gate power dissipation of 0.5 Watts, compute gate source resistance. **4**

OR

2. a) With a neat diagram explain R-triggering method of turning ON SCR. Compare R-triggering with RC triggering method. **6**

   b) Explain different modes of operation of TRIAC. **6**

   c) State applications of SCR, GTO and Triac. Compare GTO with SCR. **4**

**P.T.O.**

3. a) Draw symbol of MOSFET. With a neat diagram explain switching characteristics of MOSFET. **8**

   b) Draw a neat circuit diagram to obtain

      i) Static V-I characteristic

      ii) Transfer characteristic of IGBT.

      Draw these characteristics and explain. **8**

OR

4. a) With the help of a neat equivalent circuit diagram explain turn-on and turn-off process of MCT. **6**

   b) Compare :

      i) MOSFET with BJT

      ii) MOSFET with SCR. **6**

   c) State applications of MOSFET, IGBT and MCT. **4**

5. a) Draw circuit diagram of 1-ph fully controlled SCR bridge converter with R-L-E load. Explain its working. Draw waveforms of i) input voltage ii) Triggering pulses iii) output voltage iv) output current. **8**

   b) Draw circuit diagram of 1-ph SCR semi-converter with discontinuous current. Explain its working. Draw waveforms of i) Input voltage ii) Triggering pulses iii) Output voltage iv) Output current. Assume R-L-E load. **8**

   c) Draw graph of o/p voltage v/s firing angle for 1-ph semi-converter. **2**

OR

6. a) With a neat circuit diagram explain working of 1-ph SCR DUAL CONVERTER in

      i) Non-circulating current mode

      ii) Circulating current mode. **8**

   b) Derive the relation $\alpha_1 + \alpha_2 = 180°$ as applied to Dual converter. Explain why this condition should be satisfied. **4**

   c) What is meant by inverter operation of converter ? Draw necessary circuit diagram and output voltage waveform. **6**

SECTION – II

7. a) With a neat circuit diagram explain in detail four quadrant operation of a FOUR QUADRANT CHOPPER. **10**

   b) A step-up chopper has input voltage of 220 V and output voltage of 660 V. If the non-conducting time of SCR-chopper is 100 μs, compute the pulse-width of output voltage. In case pulse-width is halved for constant frequency operation find the new output voltage. **6**

OR

8. a) With neat diagram and waveforms explain principle of operation of step down chopper. With waveforms explain effect of change in frequency and change in duty cycle on o/p voltage. **8**

   b) Explain TRC, CLC and PWM control techniques of chopper. **8**

9. a) With neat circuit diagram and all necessary waveforms explain in detail working of 3 PHASE VSI in 180° mode. Draw equivalent circuits for step I and step II. **14**

   b) Compare 180° mode with 120° mode of operation of 3 ph VSI. **4**

OR

10. a) With neat circuit diagram and necessary waveforms explain operation of 1-ph SCR bridge inverter with i) R-load ii) RL-load. **8**

    b) State applications of 1 ph and 3 ph VSI and CSI. **4**

    c) With a neat circuit diagram and waveforms explain working of 1-ph series inverter. State its applications. **6**

11. a) Explain Multiple pulse modulation in inverters. Draw necessary waveforms and explain how four pulses per half cycle can be obtained. **8**

    b) Explain Sinusoidal pulse modulation in inverters. Draw waveforms and explain how five PWM pulses per half cycle can be obtained. **8**

OR

12. a) Write detailed note on :

    i) $di/dt$ protection

    ii) $dv/dt$ protection

    iii) Snubber circuit design as applied to SCR$^s$. **8**

    b) Write a note on 'selection of transformers and semi conductor devices for converters'. **8**

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**[3863] – 7**

# T.E. (Semester – II) (Civil) Examination, 2010
# PROJECT MANAGEMENT AND COMPUTER APPLICATION
# (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) Write a short note on work breakdown structure. **4**

   b) Draw a work breakdown structure for construction of pile foundation. **4**

   c) Draw bar chart for the above mentioned project. Assume suitable duration. **6**

   d) Also draw the calender (based on bar chart). Consider 6 days working in one week, Sunday as holiday and 8 hours per day. **4**

OR

2. a) Give definitions of following with suitable example of each : **12**

   i) Dummy activity

   ii) Critical activity

   iii) Critical path

   iv) Concurrent activity

   v) Preceeding activity

   vi) Succeeding activity

**P.T.O.**

b) Show following logic with the help of A-O-A network. **6**

i) Activity C depends on A and B.

ii) Activity P depends on C and D but activity Q depends on C only.

iii) Activity C cannot be started before completion of activities Y and X whereas D depends on X and Z.

iv) Activity S must not start before Q gets completed. Activity X depends on S but will start only after 3 days after completion of S.

v) Activities M and N depends on Q, P and O.

3. a) Explain following terms with example : **12**

i) Direct cost of an activity

ii) Indirect cost of an activity

iii) Crash cost of an activity

iv) Normal cost of an activity

b) What are the objectives of Resource Scheduling ? **4**

OR

4. a) Draw the following network.

| Activity | Succeeded by | Duration (days) | Resources |
|---|---|---|---|
| A | C, D | 3 | 4 |
| B | E | 2 | 6 |
| C | G | 1 | 3 |
| D | E | 6 | 6 |
| E | F, H | 4 | 6 |
| F | G | 5 | 8 |
| G | I, J | 3 | 5 |
| H | K | 8 | 5 |
| I | L | 5 | 4 |
| J | M | 6 | 2 |
| K | M | 9 | 1 |
| L | – | 3 | 2 |
| M | – | 3 | 2 |

i) Find the critical path and duration **6**

ii) Carry out resource smoothening **4**

iii) Carry out resource levelling **6**

(Solve the example by drawing time scale graph of the network)

5. a) What are the points to be considered while planning for site layout of a tunnel construction ? **6**

b) Write a short note on "Arbitration". **5**

c) State the importance of insurance in construction work. **5**

OR

6. a) What do you mean by inventory ? Name the list of inventory used in construction of residential building. **6**

b) Differentiate between Economic order Quantity and arbitrary order quantity. **6**

c) State any 4 functions of material manager. **4**

SECTION – II

7. a) Write a detail note on occupational Health Hazards. **9**

b) Write a safety programme for a Road project. **9**

OR

8. a) What are the causes and types of accidents ? **9**

b) Draw a site layout of a project you have visited. Name different parts with approximate distances. Also mention the activities that were taking place at the time of visit. **9**

9. a) Write flow chart and algorithm for Langragian interpolation method. **8**

b) Evaluate $\int_{1}^{3} (1-x)\cos x \, dx$ using Gauss quadrature method. **8**

OR

10. a) Write the flowchart and algorithm for Simpson's 3/8 rule. **8**

    b) Evaluate the integration given in example g(6) above by Simpson's 3/8 rule with h = 0.25. **8**

11. Write short notes on **any 4** of following : **16**

    a) Use of computers in project management

    b) Daily Reports

    c) DBM

    d) Quality control in RCC work

    e) Various softwares used in Civil Engineering

    f) Material management.

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**[3863] – 74**

**T.E. (E & TC/Electronics, Indl. Elex.) (Semester – I) Examination, 2010**
**(2003 Course)**
**MICROPROCESSOR, MICROCONTROLLER AND APPLICATIONS**

Time : 3 Hours Max. Marks : 100

***Note :*** *1) Solve from Section **1**-Q. **I** 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) Answer to the **two** Sections should be written in a **separate** book.*
*3) Assume **suitable** data if **necessary**.*

SECTION – I

1. a) Compare various architectures of the processor. **6**
   b) List various hardware tools for testing of microprocessor based circuits. Explain logic analyzer in detail. **10**

OR

2. a) Compare microprocessors and microcontrollers. **6**
   b) List various software tools for testing of microprocessor based circuits. Explain simulator in detail. **10**

3. a) Explain various addressing modes of 8051 with suitable example. **6**
   b) Explain the following instructions : **4**
      MOVC A,@A+DPTR
      CINE A, #data, code address.
   c) Explain memory organization of 8051. **6**

OR

4. a) Explain interrupt structure of 8051 with IE and IP SFRs. **8**
   b) Explain timer modes of 8051 with its SFR. **8**

5. a) Write ALP program for finding out factorial of N. **6**
   b) Write ALP program for converting temperature from centigrade to Fahrenheit. **6**
   c) Write ALP program to find out largest number of given 5 nos. **6**

OR

**P.T.O.**

6. a) Write ALP program to transfer block of data from 1 location of RAM to another location of RAM. **6**

   b) Write ALP program to add five 8-bit nos. **6**

   c) Write ALP program such that when switch connected to port 0.1 is pressed all LEDs connected to port p1 will light. **6**

SECTION – II

7. a) Interface 16 × 2 LCD display to 8051 in 4-bit mode. Explain various commands for initializing the LCD. **8**

   b) Write ALP to generate staircase using 8-bit DAC. Draw interfacing diagram. **8**

OR

8. a) Interface 4*4 keypad to 8051. Write algorithm to detect the key pressed. **8**

   b) Interface 10-bit ADC to 8051. Write ALP program to read the ADC and store the data in RAM location 50 H onwards. **8**

9. a) State features of RS232C serial communication protocol. **4**

   b) Draw interfacing diagram of RS232 for serial communication with PC. **4**

   c) Write a program to transfer a string 'Pune University' to PC from 8051. **8**

OR

10. a) Explain 12C protocol with suitable timing diagram indicating START, STOP, ACKNOWLEDGE. **10**

    b) State features of SPI protocol and compare it with 12C. **6**

11. a) State the features of 89C51 RD2. Compare it with 8051. **8**

    b) Explain the architecture of ATMEL microcontroller with suitable diagram. **10**

OR

12. a) State and explain addressing modes of PIC microcontroller. **8**

    b) Explain the architecture of PIC microcontroller with suitable diagram. **10**

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# [3863] – 80-A

## T.E. (E & Tc) (Semester – II) Examination, 2010
## NETWORK ANALYSIS AND SYNTHESIS
## (Old) (1997 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** indicate **full** marks.*
*4) **Use** of electronic pocket calculator is **allowed**.*
*5) Assume **suitable** data, if **necessary**.*

SECTION – I

1. a) Draw waveforms of unit impulse, unit step and unit ramp functions. Write their equations and find their Laplace Transforms. **6**

   b) Explain the terms tree, cotree, branch and chord in connection with graph theory. **6**

   c) Draw oriented graph of a circuit in figure 1 and find its f-cut set matrix. **6**

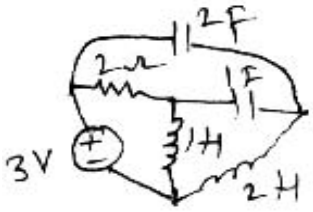


Fig. 1

2. a) Resolve the waveforms in figure 2 into its even and odd parts. **8**

Fig. 2

**P.T.O.**

b) For the network shown in figure 3, steady state is reached with switch in position a. Switch moves from a to b at t = 0, then find i(t) for t > 0. **8**


Fig. 3

3. a) Find inverse Laplace transform of **8**

i) $F(s) = \frac{s}{s^2 + 4s + 3}$

ii) $F(s) = \frac{3s + 2}{(s + 3)(s + 4)}$

b) Find driving point impedance function of the one port network in figure 4. Also find its potes and zeros. **8**

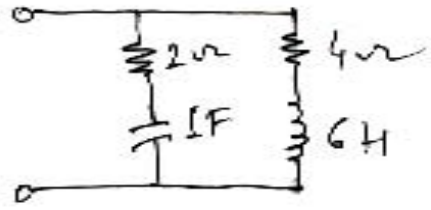


Fig. 4

4. a) For the ladder network shown in figure 5 find $Z_{21}(s)$ as a transfer function. **8**

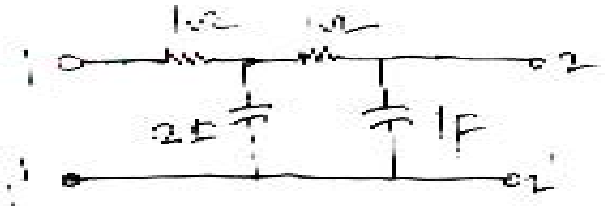


Fig. 5

b) List procedure for testing a positive real function. Also test whether a driving point impedance function $z(s) = \frac{s^2 + s + 6}{s^2 + s + 1}$ is PRF. **8**

5. a) Find foster I and foster II forms of the network described by

$$z(s) = \frac{s(s^2+4)}{(s^2+1)(s^2+6)}$$ **6**

b) Find first and second Cauer forms of the functions

$$z(s) = \frac{s(s+3)}{(s+1)(s+4)}$$

$$z(s) = \frac{(s+3)(s+5)}{(s+1)(s+4)}$$ **10**

SECTION – II

6. a) Synthesize the following function as LC ladder network terminated into $1\Omega$ resistance. **8**

$$z(s) = \frac{s^2}{s^3+4s^2+3s+5}$$

b) Realize the following transfer function as a bridge T symmetric network terminated by $1\Omega$ load. **8**

$$\frac{v_0}{v_1} = \frac{s^2+2}{s^2+3}$$

7. a) Explain with example the terms

i) Impedance scaling

ii) Frequency scaling

related to active filter design. **8**

b) Design a second order butter worth active high pass filter with cut off frequency 3 KHz. Use Sallen key configuration. **8**

8. a) Compare Butter worth and Chebyshev approximations. **4**

b) Design a passive Butter worth low pass filter to meet the specifications : **12**

Pass band attenuation < 0.4 dB for $\omega \leq 0.5$ rad/sec.

Stop band attenuation > 26 dB for $\omega \geq 4$ rad/sec.

$R_L = R_S = 1\Omega$.

9. a) Explain significance of op amp parameters on active filter response. **8**

   b) List properties of RC driving point impedance function. **4**

   c) Test whether the polynomial $s^5 + 8s^4 + 10s^3 + 8s^2 + 3s + 6$ is Hurwitz. **4**

10. Write short notes on **any three** : **18**

   i) Zeros of transmission

   ii) Incidental dissipation

   iii) All pass filter

   iv) Time domain behaviour from pole-zero locations

   v) Convolution theorem of Laplace transform.

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**[3863] – 85**

# T.E. (Instrumentation and Control) (Semester – I) Examination, 2010
## (2003 Course)
## ELECTRONIC INSTRUMENTATION

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 principle of Q meter with the help of circuit diagram. Also explain
   i) Series connection and
   ii) Parallel connection. **12**

   b) For following pulse waveform find crest factor. **4**

OR

2. a) What is necessity of Automatic test equipment ? Explain ATE with block diagram. **10**

   b) Derive the relation between V(root mean square) and peak voltage of sine wave. **6**

3. a) What is frequency synthesis ? Explain indirect frequency synthesis with block diagram. **10**

b) Explain function generator with block schematic. **8**

OR

4. a) Define jitter. Explain different jitters occurring in pulse generator. **8**

b) What is necessity of arbitrary waveform generator ? Explain it with block diagram. **10**

5. a) Explain various sweep modes in oscilloscope. **8**

b) Explain sampling oscilloscope with the help of neat block diagram. **8**

OR

6. a) Explain current probe with neat diagram. **8**

b) What is function of delay line ? Explain any one type of delay line used in CRO. **8**

SECTION – II

7. a) A 10 bit R-2R ladder type DAC has input (1A5)H. Assume Vref = 6 volts. **8**
Calculate :
i) Resolution
ii) Full scale value
iii) Analog output

b) Explain dual slope integration type ADC with block diagram. **8**

OR

8. a) Explain data logger with suitable block diagram. **8**

b) The Ramp type ADC uses 1 MHz clock frequency and a ramp voltage increases from 0 – 2 volts in a time 200 ms. Determine the pulses counted by the counter when the input voltage is
i) input voltage Vi = 1.5 V
ii) input voltage Vi = 0.5 V **8**

9. a) Explain universal counter with block diagram. **8**

b) A frequency counter with an accuracy $\pm 1$ LSD $\pm(1 \times 10^{-6})$ is employed to measure frequencies of 100 Hz, 1 MHz and 100 MHz. Calculate % measurement error in each case. Also comments on results. **8**

OR

10. a) Explain how autoranging, autozeroing and autopolarity is achieved in DMM. **10**

b) Explain following modes in universal counter :

i) Period mode

ii) Frequency ratio mode. **6**

11. a) What is telemetry ? Explain TDM with block diagram. **10**

b) Explain any three pulse modulation techniques with the help of waveforms. **8**

OR

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

i) Virtual Instrumentation

ii) Logic analyzer

iii) Distortion meter.

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**[3863] – 86**

## T.E. (Instrumentation and Control) (Semester – II) Examination, 2010
## (2003 Course)
## DIGITAL SIGNAL PROCESSING

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) 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) Determine and sketch magnitude and phase response of
$y[n] = 0.5[x[n] + x[n-2]]$ **6**

b) Determine Direct form – I and Direct form – II of
$2y[n] + y[n-1] - 4y[n-3] = x[n] + 3x[n-5]$ **6**

c) Determine the impulse response of the system described by
$y[n] = 0.6y[n-1] - 0.08y[n-2] + x[n]$ **4**

OR

2. a) A system has unit impulse response h[n] given by
$$h[n] = -\frac{1}{4}\delta[n+1] + \frac{1}{2}\delta[n] - \frac{1}{4}\delta[n-1]$$ **8**

i) Is the system BIBO stable ?

ii) Is the filter causal ?

iii) Compute the frequency response.

b) Explain the effect of finite word length in digital filter. **4**

c) Compute the inverse Z – transform of $X(z) = \frac{z^{-1}}{1-3z^{-1}}$ ROC : $|z| < 3$ **4**

**P.T.O.**

3. a) Perform circular convolution of the following two sequences x[n] = {2, 1, 2, 1} and h[n] = {4, 3, 2, 1}. **4**

   b) Find the IDFT of the following spectrum using DIT – FFT of X(k) = {10, –2+2j, –2, –2–2j}. **6**

   c) State and prove the following properties of DFT **8**

      1) Periodicity property

      2) Circular convolution.

OR

4. a) Deduce the derivation of radix-2 DIT – FFT algorithm. **8**

   b) Compute 8-point DFT of the given sequence as $x[n] = \left(\frac{1}{2}\right)^n$ using DIT – FFT. **10**

5. a) What is Gibb's phenomenon ? Explain the need of window function in design of FIR filter. **4**

   b) Design a filter with

$$H_d(e^{jw}) = e^{-3jw} \quad -\frac{\pi}{4} \le w \le \frac{\pi}{4}$$
$$= 0 \quad \frac{\pi}{4} < |w| \le \pi$$

   using Hamming window with N = 7. **12**

OR

6. a) What are the different types of windows used for filter design ? Explain in brief. **4**

   b) Using frequency sampling method, design a low pass FIR filter to meet the following specifications

   passband 0 – 5 KHz

   sampling frequency 18 KHz

   filter length 9 **12**

SECTION – II

7. a) Compare impulse invariance method and Bilinear transformation method of IIR filters. **4**

   b) Design a digital Chebyshev filter to satisfy the following constraints :

$$0.707 \le |H(e^{jw})| \le 1 \quad 0 \le w \le 0.2\pi$$
$$|H(e^{jw})| \le 0.1 \quad 0.5\pi \le w \le \pi$$

   using bilinear transformation, $T_s$ = 1 sec. **14**

OR

8. a) Determine H(z) for Butterworth filter satisfying the following constraints

$$\sqrt{0.5} \le |H(e^{jw})| \le 1 \quad 0 \le w \le \pi/2$$
$$|H(e^{jw})| \le 0.2 \quad 3\pi/4 \le w \le \pi$$

   with $T_s$ = 1 sec. Apply Impulse Invariance. **14**

   b) Differentiate between FIR and IIR filters. **4**

9. a) List out the general purpose registers in TMS320 C67XX. Explain in detail. **8**

   b) Explain the concept of pipelining with respect to DSP processor. **8**

OR

10. a) Explain the architecture of DSP processor in detail. **8**

    b) Explain the addressing modes of TMS 320 C671X DSP processor. **8**

11. a) Write assembly language instructions for TMS 320 C671X for

    i) Absolute value of a 16-bit number

    ii) Explaining indirect mode of addressing

    iii) Multiplication of two 16-bit numbers. **8**

    b) What is cross path in DSP processor ? Explain in detail. **8**

OR

12. a) Write a short note on :

    i) Fetch packet and execute packet

    ii) Parallel operations

    iii) Logical instructions. **8**

    b) List out the salient features of TMS320 C67XX processor (any eight). **8**

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# [3863] – 89

## T.E. (Instrumentation and Control) (Semester – II) Examination, 2010
## INSTRUMENTATION SYSTEM DESIGN
## (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) Compare DIN and NEMA standard. **8**

   b) What is significance of "Index of Protection" ? Explain IP56 and IP54. **8**

OR

2. a) Compare BIN with ANSI standard. **8**

   b) What are the methods of product designing ? **8**

3. a) What is "Triboelectric effect" ? Explain "Human body model" with diagram. **8**

   b) Explain flatface control panel. Also explain its three types. **8**

OR

4. a) What are methods used to protect the systems with electrostatic discharge, when connected with interface cable ? **8**

   b) Explain briefly shot noise, thermal noise, popcorn noise and contact noise. **8**

**P.T.O.**

5. a) Explain the features of HCNR 200. Also explain with the help of suitable diagram how HCNR 200 can be used for isolation. **9**

   b) Explain how pressure measurement is possible using AD620 instrumentation amplifier. **9**

OR

6. a) 1) What is output voltage of AD595 when 200°C temperature is applied to pin number 1 and 14 through k type thermocouple ? While output voltage of this thermocouple is observed to be 8.137 mv ? **6**

   2) What caution should be taken while testing AD595 or AD594 ? **3**

   b) What are the salient features of XTR110 ? What is the transfer function of XTR110 ? Elaborate one application of XTR110 with suitable diagram. **9**

## SECTION – II

7. Draw a test circuit of 4 digit LED programmable up-down counter 7217A and explain the following pin functions. **18**

   i) Equal

   ii) Zero

   iii) Store

   iv) Load counter

   v) Load register

   vi) Display counter.

OR

8. a) What are the features of 7107 (Digital Panel Meter) ? Also explain principle of working as well as a typical application with suitable diagram. **9**

   b) What is concept of optical isolation ? What are features and practical applications of MCT2E (opto coupler). **9**

9. a) What are four problems that affect the performance of digital circuit if the PCB is not properly designed ? **8**

   b) What are the thumb rules followed for placement of components on printed circuit boards ? **8**

OR

10. a) Explain the rules followed for designing a printed circuit board layout for analog circuits. **8**

    b) Explain the flexible and multilayer PCB. **8**

11. a) What do you mean by catastrophic failures ? Explain with the help of "Bath tub curve". **8**

    b) What are traceability standards ? **8**

OR

12. a) What is necessity of calibration ? Explain the basic elements of calibration process. **8**

    b) What are the advantages of system simulation using virtual instrumentation ? Elaborate one application. **8**

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**[3863] – 9**

# T.E. (Civil) (Semester – II) Examination, 2010
# ENVIRONMENTAL ENGINEERING – I
# (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**.*
*8) 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**.*

## SECTION – I

1. a) List the sources of noise and explain various effects caused due to noise pollution on human. **6**

   b) Explain :

      i) Ecology ii) Water pollution **4**

   c) Write short note on :

      i) Composting ii) Sanitary landfill **8**

OR

2. a) Explain on site handling, storage and processing of solid wastes. **6**

   b) Explain various techniques used to control noise pollution. **6**

   c) Describe the classification of solid wastes. **6**

**P.T.O.**

3. a) State standards specified by CPCB for ambient air for various categories of area. **4**

   b) Write short note on : **12**

      i) Stability of atmosphere and its effects on dispersion of air pollutants

      ii) Fabric filter.

OR

4. a) Define "Air Pollution" as per IS. Enlist major natural and man made sources of Air Pollution. **5**

   b) What is the effect of stable, unstable and neutral atmosphere on dispersion of Air Pollutants ? **5**

   c) Explain the methods used to control vehicular pollution. **6**

5. a) How is the provision made for fire demand in water supply scheme ? **4**

   b) Define Rainwater harvesting. Write different types of rainwater harvesting system and explain any one in detail. **6**

   c) The following data has been noted from the census department **6**

| **Year** | 1970 | 1980 | 1990 | 2000 |
|---|---|---|---|---|
| **Population** | 8000 | 12000 | 17000 | 22500 |

   Forecast the population for year 2010, 2020 and 2030 by means of incremental increase method.

OR

6. a) Explain need of rainwater harvesting system and precautions to be taken for rainwater harvesting. **6**

   b) Write down the standards of Govt. of India for drinking water for the following : **4**

      i) pH ii) Fluorides

      iii) Mitrites iv) Iron

      v) Chlorides vi) MPN

      vii) Hardness viii) Sulphates

   c) Describe different phases involved in a water supply scheme. **6**

SECTION – II

7. a) Explain theory of coagulation. Give equations of coagulation by Alum. **6**

   b) Explain the purpose and limitations of aeriation. **4**

   c) Design a circular sedimentation tank fitted with mechanical sludge remover for a water work which has to supply daily 4.2 million litres of water to the town. The detention period in the tank for water is 4.5 hrs. and the depth of water in the tank may be assumed 3.3 m. **8**

OR

8. a) Explain theory of sedimentation. Prove that, theoretically, the surface loading Q/A and not the depth of water is a measure of effective removal of particles in sedimentation tank. **7**

   b) Draw a flow diagram of river water treatment process for a city. Explain the purpose of any two units used for water treatment. **7**

   c) What do you mean by treatment of water ? State the objects of treatment of water. **4**

9. a) Define filtration. What are the objects of filtration ? **4**

   b) Enlist various methods of disinfecting water. Comment on chlorination as the best method of disinfection for public water supplies. **6**

   c) Explain electrodialysis. **6**

OR

10. a) Explain zeolite process to remove hardness. Give the appropriate chemical equations. **4**

    b) Explain theory of chlorination. State the factors affecting chlorine demand. **6**

    c) Design a rapid sand filter unit for treating $5\times10^6$ e/d supply for a town. The filter has to work day and night. Take 4500 e/$m^2$/hr as the rate of filtration. **6**

11. a) Compare continuous and intermittent systems of water supply. **4**

    b) Enlist any 8 appurtenances used in the water distribution system. Explain the requirements of a good water meter. **8**

    c) Write short note on mass curve method. **4**

OR

12. a) Explain the necessity of distribution reservoir and the way in which its capacity is fixed. **6**

    b) State the requirements which are considered while designing the distribution system. **4**

    c) Explain the following layout system for distribution : **6**

        i) Dead end system

        ii) Radial system.

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# [3863] – 90

## T.E. (Instrumentation and Control) (Semester – II) Examination, 2010
## INDUSTRIAL 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**.*

SECTION – I

1. a) What is Business process Re-engineering ? Explain its importance to the business in present context. **8**

   b) Define Management. State various functions of a business enterprise. Explain the role of an entrepreneur in a changing business scenario. **8**

OR

2. a) Explain following concepts : **10**
      i) Ishikawa and Reverse Ishikawa diagrams
      ii) Mind mapping.

   b) What is organisation structure ? Explain in brief various types of organisational structure. **6**

3. a) State and explain the role of WTO in International business. **8**

   b) What is patent ? How it differs from copy right ? Explain patent procedure. **8**

OR

4. a) Explain business strategy. How mergers and take-overs considered as a potential business strategy in a competitive market. **10**

   b) State and explain the salient features of ISO-9000 and ISO-14000. **6**

**P.T.O.**

5. A manufacturing company uses 36,000 units of a specific component based on production forecasting data. Ordering cost is estimated at Rs. 500/- per order and Inventory carrying cost is 25% of the average annual inventory investment. However, the supplier offers a price discount as follows :

| **Order quantity** | **Price (Rs.)** |
|---|---|
| 0 – 2000 | 20 |
| 2001 – 4000 | 18 |
| 4001 – 6000 | 15 |
| 6000 and above | 12 |

Assuming 300 working days in a year,

Determine :

a) Economic order quantity

b) Inventory cycle time

c) No. of orders per year

d) Optimal quantity and minimum cost. **18**

OR

6. a) State and explain the concept of supply chain management for leveraging business profit. **8**

b) What is production planning ? Explain the objectives and Techniques of production planning. **10**

SECTION – II

7. a) Define leadership. Explain various types of leadership skills with its impact to the development and growth of business. **8**

b) Define motivation. Explain Maslow's theory of motivation. **8**

OR

8. a) What is training ? Explain various methods of training imparted to industrial workers. **8**

b) Explain man power planning. What are its functions and processes ? **8**

9. a) Explain following : **8**

   i) Profit and loss Account

   ii) Types of project costs.

   b) Define capital structure. Explain various sources of working capital. **8**

OR

10. a) State and explain various steps in project report preparation. **8**

   b) Explain following concepts : **8**

   i) Letters of credit

   ii) Pay back period.

11. State and explain the salient features of and legal framework of Company Act 1956 and Factory Act, 1948. **18**

OR

12. Write short notes on **any three** of the following : **18**

   a) Value added Tax

   b) Inspection

   c) Sources of Finance to Business enterprises.

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# T.E. (E & TC/Electronics, Indl. Elex) (Semester – II) Examination, 2010
## ELECTROMAGNETIC WAVES AND RADIATING SYSTEMS
## (2003 Course)

Time : 3 Hours Max. Marks : 100

***N.B.*** *: i) Answer **three** questions from Section **I** and **three** questions from Section **II** i.e. (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**).*

*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, slide rule, Mollier charts, electronic pocket calculator and steam tables is **allowed**.*

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

SECTION – I

1. a) Derive the magnetostatic boundary conditions at an interface between two different media. **8**

   b) Derive the expression for the energy stored per unit volume in an electric field in terms of $\overline{E}$ and $\overline{D}$. **8**

OR

2. a) Obtain the Magnetic field intensity due to infinite long straight conductor carrying current I at any point $P(r, \theta, \phi)$ using ampere's circuital law. **8**

   b) Derive the relation between electrostatic potential (v) and electric field intensity $\overline{E}$. Also write the expressions for potential at a field point P because of

   i) line charge distribution

   ii) surface charge distribution

   iii) volume charge distribution **8**

**P.T.O.**

3. a) State the Maxwell's equation in point from for static electric and steady magnetic field. Explain how these are modified for time varying fields. **8**

   b) Let $\mu = 3\times10^{-5}\,H/m$, $\epsilon = 1.2\times10^{-10}\,F/m$ and $\sigma = 0$ everywhere. If $H = 2\cos(10^{10}t - \beta x)\,\bar{a}_z\,A/m$. Use Maxwell's equations to obtain expressions for $\bar{B}, \bar{D}, \bar{E}$ and $\beta$. **10**

OR

4. a) What is poynting vector ? What is its significance ? Derive the expression for poynting vector. Interpret each term. **10**

   b) A certain material has $\sigma = 0$, $\mu_r = 1$. If $E = 800\sin(10^6 t - 0.01z)\,\bar{a}_y\,V/m$, Make use of Maxwell's equation to find '$\epsilon_r$'. **8**

5. a) Derive the relationship between depth of penetration $\delta$ and conductivity $\sigma$ for a plane wave incident on a good conductor. **8**

   b) A 9.375 GHz uniform plane wave is propagating in polyethylene ($\epsilon_r = 2.26$). If the amplitude of the electric field intensity is 500 V/m and the material assumed to be lossless find

   i) phase constant ii) wavelength in polyethylene

   iii) velocity of propagation iv) intrinsic impedance. **8**

OR

6. a) A uniform plane wave propagating in a medium has $E = 2e^{-\alpha z}\sin(10^{8t} - \beta z)\,\bar{a}_y\,V/m$. If the medium is characterised by $\epsilon_r = 1$, $\mu_r = 20$, and $\sigma = 3$ ℧/m find $\alpha, \beta$ and $\bar{H}$. **8**

   b) What is polarization of uniform plane wave ? Explain linear and circular polarization. **8**

SECTION – II

7. a) What is reflection on transmission line ? What are disadvantages of the same ? Explain in brief the terms reflection coefficient and standing wave ratio. **8**

   b) An open wire line has a characteristic impedance of 700 $\angle -12^{\circ}\ \Omega$ and a propagation constant $\gamma = 0.012 + j0.058$ when 2 V are applied to sending end and current of 4 mA flows in. What will be the current at the distant end, which is 50 km away from the sending end ? **8**

OR

8. a) What is single stub matching ? Explain the merits and demerits of single stub matching. **8**

   b) Calculate the characteristic impedance, propagation constant and velocity of propagation at 400 KHz for transmission line having L = 0.5 mH/Km, C = 0.08 $\mu$F and negligible R and G. **8**

9. a) What are retarded potentials ? Derive the expression for the same. **8**

   b) What is radiation resistance ? Derive the typical value of the same for the half wave dipole. **8**

OR

10. a) State and explain the following antenna parameters. **8**

   i) Field radiation pattern ii) Power radiation pattern

   iii) Directive gain iv) Directivity

   b) Show that the radiation resistance of Hertzian dipole is $80\pi^2\left(\frac{dL}{\lambda}\right)^2$. **8**

11. a) What is an antenna array ? What is an array factor ? Compare Broad side array with end fire array. **10**

   b) Explain with neat sketch construction and working of Yagi-Uda antenna. **8**

OR

12. Explain the general working principle with neat sketch if necessary **(any three)** :

   i) Horn antenna ii) Parabolic antenna

   iii) Microstrip antenna iv) Helical antenna

   v) Pattern multiplication. **18**

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# T.E. (Electrical) (Sem. – II) Examination, 2010
# 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) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is **allowed.***

SECTION – I

1. a) Describe the advantages of providing field winding on rotor and the armature winding on stator in case of large synchronous machines. **4**

   b) Derive an expression for the emf generated in the armature winding of a synchronous machine. **6**

   c) A 3-phase, 10 KVA, 400 V, 50 Hz, star connected alternator supplies the rated load of 0.8 p.f. lagging. If the armature resistance is 0.5 Ω per ph. and synchronous reactance is 10 Ω per phase, find :

      i) Voltage regulation

      ii) Power angle. **6**

OR

2. a) What do you mean by distribution factor of an alternator ? Derive expression for distribution factor. **8**

   b) Explain 2PF method for finding voltage regulation of a 3-phase synchronous generator. **8**

**P.T.O.**

3. a) Explain the slip test to be conducted on an alternator to determine Xd and Xq. **8**

   b) A 3-phase alternator has Xd = 0.85 pu and Xq = 0.55 pu. Draw the phasor diagram for the alternator when operating on full load at 0.8 p.f. lagging and determine therefrom i) the load angle ii) the no load p.u. voltage iii) p.u. voltage regulation. Neglect armature resistance. **8**

OR

4. a) Derive the expression for synchronising torque of an alternator. **6**

   b) What are the conditions for proper parallel operation of 3 - phase alternators ? **4**

   c) Two alternators working in parallel supply a lighting load of 3000 KW and motor load amounting to 5000 KW at a p.f. of 0.71 lagging. One machine is loaded upto 5000 KW at 0.8 p.f. lagging. What is the load and p.f. of the other machine. **6**

5. a) Write short note on synchronous induction motor. **6**

   b) Explain the effect of excitation on power factor on synchronous motor at constant load. **4**

   c) A 3980 - V, 50 Hz, 4 - pole star connected synchronous motor generates back emf of 1790 V per phase. The resistance and synchronous reactance per phase are 2.2 Ω and 22 Ω respectively. The torque angle 30°C. Calculate the i) resultant armature voltage/phase ii) armature current / phase iii) power factor of the motor iv) gross torque developed by the motor. **8**

OR

6. a) Describe the hunting phenomenon in synchronous machines. What are the causes of hunting ? What is the roll of damper winding ? **6**

   b) With neat sketches explain operation of a synchronous induction motor. How its performance differ from a synchronous motor ? **6**

   c) Explain the effect of variation of load on a three phase synchronous motor. **6**

SECTION – II

7. a) Explain the constructional features, principle of operation, working and applications of single phase hysteresis motors. **8**

   b) For linear induction motor, derive an expression for linear force in terms of specific loadings and linear dimensions. **8**

OR

8. a) Explain the torque - pulse rate characteristics of a stepping motor. **8**

   b) What are linear electrical machines ? Give the principle of operation of LIM. **8**

9. a) What are synchronous harmonic and induction harmonic torques that may appear in an induction motor ? **8**

   b) Explain the methods used in synchronous machines to reduce harmonics. **8**

OR

10. a) What are the causes of space harmonics in the air gap flux wave of 3 - phase induction motor ? **8**

    b) Explain how the space harmonics in the air gap flux wave introduce harmonic asynchronous torques and give rise to crawling. **8**

11. a) What is Kron's primitive machine ? How are the various windings of a machine represented by the primitive machine ? **8**

    b) Obtain identical transformation for currents and voltages from rotating balanced 3 - phase (a,b,c) winding to rotating balanced 2 - phase $(\alpha, \beta)$ winding. Show that power invariance is maintained under this transformations. **10**

OR

12. a) Explain the various limitations of the generalized theory of electrical machines. **8**

    b) Write voltage equations for the mathematical model of a 3 - phase induction machine and hence obtain an expression for steady state torque when balanced 3 - phase supply is connected to the stator. **10**

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# T.E. (E&TC / Electronics, Indl. Elex) (Sem. – II) Examination, 2010
# INFORMATION THEORY AND CODING TECHNIQUES
# (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) **All** questions are **compulsory**.*

SECTION – I

1. a) For finite variance, the Gaussian random variable has the largest differential entropy attainable by any random variable. Justify the statement. What is H(x) for an uniformly distributed random variable X over the interval [0, a] ? **8**

   b) A DMS has three symbols $S_1$, $S_2$, $S_3$ with probabilities 0.4, 0.35, 0.25 respectively. Determine the Huffmann code for first and second order extension. Calculate the average code word length and efficiency of the code. **8**

OR

2. a) Determine the Lempel - Ziv code for the following bit stream.

   0100 1111 1001 0100 0001 0101 0110 0110 000

   Recover the original sequence from the encoded stream. **8**

   b) Write short notes on :

   i) Data Compaction

   ii) Shannon's channel capacity theorem. **8**

3. a) A voice grade telephone channel has the bandwidth of 3.4 KHz. If the signal to noise ratio on the channel is 30 dB, determine the capacity of the channel. If the above channel is to be used to transmit 48 kbps g data, determine the minimum SNR required. **8**

   b) Explain sphere packing problem. **4**

   c) Explain water filling interpretation of information capacity theorem. **4**

OR

4. a) Explain the rate distortion function. **6**

   b) Show that the Shannon's limit for an AWGN channel is equal to – 1.6 dB, in the information capacity theorem. **10**

5. a) For a systematic linear block code, the three parity check bits $C_4$, $C_5$, $C_6$ are given by

   $C_4 = d_1 \oplus d_2 \oplus d_3$

   $C_5 = d_1 \oplus d_2$

   $C_6 = d_1 \oplus d_3$

   1) Construct generator matrix.

   2) Find out all the possible code words.

   3) Determine error correction capability.

   4) Prepare a suitable decoding table.

   5) Decode the received words 101100 and 000110. **12**

   b) Compare the following with respect to its error correction capability and efficiency :

   1) Fire codes

   2) Golay codes

   3) CRC codes

   4) Hamming codes. **6**

OR

6. a) Obtain the generator matrix and parity check matrix for (7, 3) systematic cyclic code. Verify the result with syndrome. **12**

   b) What is burst error ? How does burst error correction take place ? Explain with suitable example. **6**

SECTION – II

7. a) For the convolutional encoder shown in fig. 1, determine the constraint length and dimension of the code. Construct the code tree, state diagram, trellis diagram. Find out the output of the encoder corresponding to the message sequence 10111 using trellis. **12**

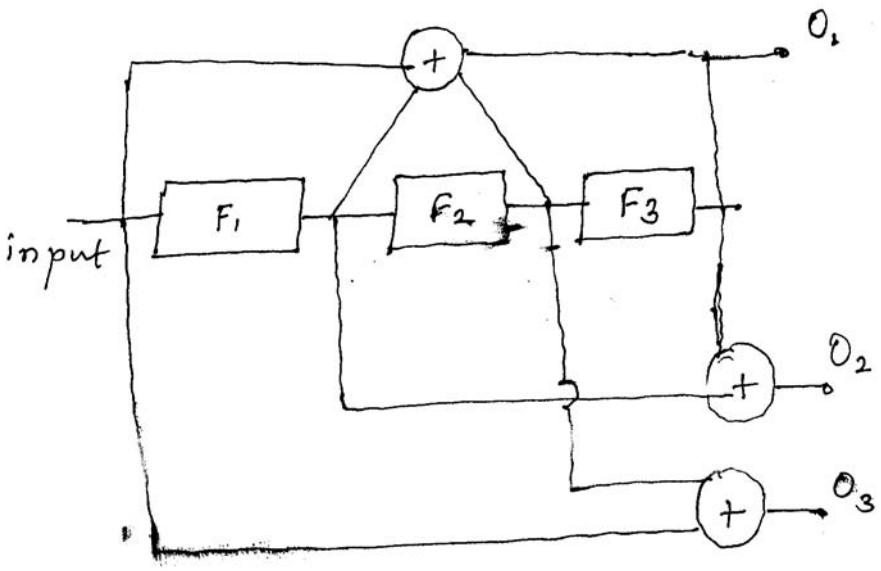


Fig. 1

b) What are turbo codes and explain the necessity of interleaver in turbo codes ? **6**

OR

8. a) Explain in detail about Viterbi algorithm with an example. **10**

b) Compare the performance of binary symmetric channel and binary AWGN channel with respect to asymptotic coding gain. **8**

9. a) Find the generator polynomial for BCH code over GF(16) using primitive polynomial $g(x) = x^2 + x + 2$ over GF(4) code word. The code should correct 2, 3 and 4 errors. **8**

b) What are data encryption standards ? Discuss in brief about symmetric and asymmetric cryptography. **8**

OR

10. a) Discuss in detail about RSA algorithm. Encode the word 'ITCT' using the key generated by two primes 29 and 61. **8**

    b) Explain JPEG compression standards and its application. **8**

11. a) What do you mean by diversity ? Enlist different types of diversity techniques and explain any one with the help of block diagram. **8**

    b) Compare TDMA, FDMA, CDMA and SDMA wireless communication systems. **8**

OR

12. a) A radio link uses a pair of 2 m dish antenna with an efficiency of 60% each as transmitting and receiving antennas. Other specifications of the link are :

    i) Transmitted power = 1 dBw

    ii) Carrier frequency = 4 GHz

    iii) Distance between trasmitter and receiver is 150 m.

    Calculate :

    a) Free space loss

    b) Power gain of each antenna

    c) Received power in dBw. **8**

    b) Explain the following terms with respect to mobile communication :

    1) Frequency reuse

    2) Cell splitting

    3) Hand off

    4) Cluster. **8**

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# T.E. (Printing) (Sem. – II) Examination, 2010
# DIGITAL COLOUR IMAGING AND COLOUR MANAGEMENT
# (2003 Course)

Time : 3 Hours Marks : 100

***Instructions**:1) **Neat** diagrams must be drawn **wherever** necessary.*
*2) Black figures to the **right** indicate **full** marks.*

1. A) Explain Additive Colour Theory and Substructure Colour Theory. **10**

   B) Write short notes on **any two :** **8**

   1) Hering's opponent colour theory

   2) Scotopic vision, photopic vision

   3) Human vision deficiency

OR

1. A) Explain the following points for illuminants **8**

   1) Spectral power distribution graph.

   2) Color Temperature

   3) Co-related color temperature

   4) Color Rendering Index.

   B) Explain human vision mechanism by considering following points **10**

   1) Fovea Region

   2) Cones

   3) Rods

   4) 2° and 10° observer angle

**P.T.O.**

2. Solve **any two** : **16**

   A) Explain color system based on color matching function – CIE XYZ

   B) Explain the measurement geometry of measuring instrument.

   C) Compare densitometer, colorimeter, and spectrophotometer

3. Answer **any two** : 16

   A) Explain the need of color management

   B) Explain the device dependent color space CIE Lab

   C) Explain the color management workflow

4. A) Solve **any two** : **6**

      1) Color Gamut

      2) Color Management module (CMM)

      3) Profile connection space (PCS)

   B) Answer **any one** : **10**

      1) Explain Input, Output and Display profile

      2) Explain Perceptual and Colorimetric rendering intent and their application.

5. Answer **any two** : **16**

   A) Explain the term standardization. Explain any standardized input to output printing workflow.

   B) Explain the term calibration, also explain Proofer calibration for any substrate.

   C) Short notes on :

      1) Color trapping

      2) Hue error, gray error

      3) Gray balance

6. A) Explain Electrophotography Printing Process **9**

OR

A) Explain Ink Jet Printing technology. **9**

B) Explain Internal and External drum scanner. **9**

OR

B) Explain Digital photography by considering following points. **9**

1) White point

2) Lens

3) Aperture

4) Shutter

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**[3763] – 180**

# T.E. (Chemical Engineering) (Sem. – II) Examination, 2010
# INDUSTRIAL ORGANISATION AND MANAGEMENT
# (2003 Course)
# (Common to Biotechnology)

Time : 3 Hours Max. Marks : 100

***Instructions**:1) Answer **three** question from Section – **I** and 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.*

SECTION – I

1. a) Explain the contributions made by F.W. Taylor to the Scientific Management. **8**

   b) Explain with a neat sketch line and staff organization along with advantages and limitations. **8**

   OR

   a) Differentiate Partnership and Proprietorship as a form of business. **8**

   b) Explain Management by Objectives. **8**

2. a) Explain Job evaluation along with steps involved in it. **8**

   b) Explain in detail role of Trade Unions in Chemical Industry. **8**

   OR

   a) What is recruitment ? Explain various sources of recruitment ? **8**

   b) What is basic difference between Wages and Incentives ? Explain any two types of wages and give characteristics of good wages. **8**

3. a) What is purchasing ? Explain various steps for effective purchasing. **9**

   b) What are the stores records ? Explain bin cards and stores ledger accounts. **9**

   OR

   a) Explain Tenders along with its types. State various terms and conditions in tenders. **9**

   b) Explain the various steps of Quality Control for manufacture of Pesticides. **9**

**P.T.O.**

SECTION – II

4. a) Give the difference between Marketing and Selling. **8**

   b) Select a Chemical Product of your choice and explain how will you market the product. **8**

   OR

   a) What is Price Fixation ? What are the factors affecting on Price Fixation ? **8**

   b) Explain Advertising in detail. Give advantages of Advertising. **8**

5. a) Explain role of Quality Circle in Chemical Industry. **8**

   b) What is Patent ? Explain the Patent Rights. **8**

   OR

   a) Explain the necessity and advantages of ISO systems for Chemical Industry. **8**

   b) Explain the Procedure of Import of goods in India. **8**

6. a) What is Contract ? Explain the different types of Contracts. **9**

   b) What is Flow Diagram ? Explain with a suitable example. **9**

   OR

   a) Explain the salient Features of MRTP act. **6**

   b) Write a short Note on : **12**

      i) Therbligs

      ii) Concept of Guarantee and Warranty.

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**[3763] – 198**

# T.E. (Computer Engineering) (Semester – II) Examination, 2010
# MANAGEMENT INFORMATION SYSTEMS
# (2003 Course)

Time : 3 Hours Marks : 100

***Instructions**:1) Answer **3** questions from **each** Section.*
*2) Answers to the **two** Sections must be written on **separate** answer books.*
*3) Assume suitable data if **necessary**.*
*4) Draw sketches **wherever** necessary.*
*5) Figures to the **right** indicate **full** marks.*

SECTION – I

1. A) What is information system ? Explain various types of information systems with suitable examples. **9**

   B) What are the different levels of management ? Why does a manager need to understand these levels of management ? **8**

   OR

2. A) How does the use of Information Technology (IT) support business operations and decision-making in a telecom service provider company ? **9**

   B) What are different models of organization structure ? Which is the model suitable for IT sector ? **8**

3. A) What is human resource management (HRM) ? What are the major differences between HRM in IT and other sectors ? **9**

   B) Explain different business processes in banking systems used by leading banks. **8**

   OR

**P.T.O.**

4. A) Explain the importance of MIS in education sector. **9**

   B) Differentiate between service and product. What is distinctive service ? **8**

5. A) What is ERP ? What resources do ERP systems manage ? **8**

   B) What are major benefits of implementing ERP systems ? Explain it with suitable examples. **8**

OR

6. A) What is call center ? What are the different activities performed in the call center ? **8**

   B) What is BPO ? What are processes that can be outsourced ? Give a classification of BPOs. **8**

SECTION – II

7. A) How can you differentiate online e-commerce applications from other online applications ? Explain it with suitable examples. **9**

   B) What is CRM ? Explain different phases of CRM. Give benefits of CRM. **8**

OR

8. A) Discuss the role of supply-chain management in automobile sector. **9**

   B) Explain the challenges faced by integrated e-commerce business in Indian environment. **8**

9. A) What is DSS ? Compare DSS with ERP and MIS. **9**

   B) Discuss in details any application of DSS. What are modern techniques used in design of DSS ? **8**

OR

10. A) Explain knowledge-based expert system with a proper example. **9**

    B) Why do expert systems fail ? What are their limitations ? **8**

11. A) What are the legal issues involved in use of IT products ? How do we deal with them ? **8**

    B) What are major business drivers for global IT ? **8**

OR

12. A) Explain the need for information security ? Explain what measures we can take to stop computer crimes ? **8**

    B) Discuss limitations of biometric security. Which is the technique best suited for financial transactions ? **8**

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**[3763] – 259**

# T.E. (Information Technology) (Sem. – II) Examination, 2010
# SOFTWARE ENGINEERING
# (2003 Course)

Time : 3 Hours Max. Marks : 100

***Instructions**:1) Answers to the **two** Sections should be written in **separate** answer books.*
*2) From Section **I** answer Q. **1** or Q. **2**, Q. **3** or Q. **4**, Q. **5** or Q. **6** and answer Q. **7** or Q. **8**, Q. **9** or Q. **10**, Q. **11** or Q. **12**.*
*3) **Neat** diagrams must be drawn **wherever** necessary.*
*4) Figures to the **right** indicate **full** marks.*

SECTION – I

1. a) State and explain five generic process framework activities. **10**

   b) "Although industry is moving towards component based construction most software continues to be custom built". Explain. **8**

OR

2. a) Explain with diagram formal techniques available for assessing the software process. **10**

   b) State and explain software practitioners myths and reality. **8**

3. a) What is the importance of testing practices ? What are the principles of testing practices ? **8**

   b) What questions must be asked and answered to develop realistic project plan ? **8**

OR

4. a) Explain with example architecture defined and developed as part of Business Process Engineering. **8**

   b) What does the system Engineering model accomplish ? **8**

**P.T.O.**

5. a) What is required to develop an effective use case ? **6**

   b) What information is produced as a consequence of requirement gathering ? **4**

   c) Define following terms with suitable example. **6**

      1. Cardinality

      2. Modality.

OR

6. a) Draw and explain context level, level 1 and level 2 DFD for college gathering. **10**

   b) Explain concept of structured analysis and object oriented analysis and point out the difference between two analysis models. **6**

SECTION – II

7. a) What is meant by design process ? What is the characteristics of a good design ? **8**

   b) Explain the following architectural styles with neat diagrams. **8**

      i) Data centered architecture

      ii) Data flow architecture

      iii) Call and return architecture

      iv) Layered architecture.

OR

8. a) Explain the term the people and the product of management spectrum. **8**

   b) Explain the following quality attributes maintainability, integrity and usability. **8**

9. a) Explain the following software estimation decomposition techniques

   i) FP based **4**

   ii) LOC based. **4**

   b) Why is it difficult to develop an estimation technique using use cases ? What is software scope ? **8**

OR

10. a) Explain decision tree to support make buy decision with an example. **8**

    b) Explain process based estimation with an example. **8**

11. a) What is software configuration management ? **2**

    b) Explain SCM Repository. **2**

    c) What are roles, features and contents of SCM repository ? **5**

    d) What are activities of software maintenance ? **2**

    e) Explain software reengineering process model with a diagram. **7**

OR

12. a) How is configuration audit conducted ? **2**

    b) Explain the change control process with a neat diagram. **7**

    c) Explain following terms in details

    i) Version Control **3**

    ii) Restructuring **3**

    iii) Forward Engineering. **3**

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**[3863] – 111**

# T.E. (Petroleum) (Semester – I) Examination, 2010
# MATHEMATICAL METHODS FOR PETROLEUM ENGINEERING
# (2003 Course)

Time : 3 Hours Max. 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 f (z) = u + iv is analytic, find f (z) if
   $u - v = (x - y)(x^2 + 4xy + y^2)$, where f (1) = 1. **6**

   b) Obtain C.R. equations in polar form
   If f (z) = u + iv is analytic, show that u, v satisfy Laplace equation in polar form. **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**

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

$$= 0, \qquad z = 0$$

Show that Cauchy-Riemann equations are satisfied at origin but f (z) is not analytic there.

**P.T.O.**

b) Show that analytic function f (z) with constant amplitude is constant. **5**

c) Show that under the transformation W = sinhz **6**

Family of straight lines parallel to y-axis and x-axis are mapped on to family of ellipses and hyperbolae respectively, in w-plane.

3. a) Evaluate : **6**

$$\oint_c \frac{z^2+1}{z-2}\,dz$$

where i) C is the circle | z – 2 | = 1

ii) C is the circle | z | = 1

b) Find residues at each of the poles of **5**

$$f(z) = \frac{z^3+2}{(z-1)^2(z+i)(z+2)}$$

c) Using Cauchy - Residue theorem, evaluate **6**

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

OR

4. a) Evaluate $\oint_c \frac{\sin^2 z}{\left(z-\frac{\pi}{6}\right)^3}\,dz$, where c is | z | = 1 **6**

b) Find residues at each of the poles of **5**

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

c) Evaluate, using complex variable method. **6**

$$\int_0^{2\pi} \frac{\sin 2\theta}{5+4\cos\theta}\,d\theta$$

5. a) For the following distribution, find (i) first four moments about the mean, (ii) $\beta_1$ and $\beta_2$ (iii) arithmetic mean (iv) standard deviation. **8**

| **x** | 2 | 2.5 | 3 | 3.5 | 4 | 4.5 | 5 |
|---|---|---|---|---|---|---|---|
| **y** | 5 | 38 | 65 | 92 | 70 | 40 | 10 |

b) Following are the values of import of raw material and export of finished product in suitable units. **8**

| **Export** | 10 | 11 | 14 | 14 | 20 | 22 | 16 | 12 | 15 | 13 |
|---|---|---|---|---|---|---|---|---|---|---|
| **Import** | 12 | 14 | 15 | 16 | 21 | 26 | 21 | 15 | 16 | 14 |

Calculate the coefficient of correlation between the export and import values.

OR

6. a) Two dice are thrown 100 times and the number of nines recorded. What is the probability that r nines occur ? Find the probability that at least 3 nines occur. **5**

b) Fit a Poisson distribution to the following frequency distribution and compare the theoretical frequencies with observed frequencies. **6**

| **x** | 0 | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|---|
| **f** | 158 | 160 | 60 | 25 | 10 | 2 |

c) A random sample of 200 screws is drawn from a population which represents the size of screws. If a sample is distributed normally with mean 3.15 cm. and standard deviation 0.025 cm, find expected number of screws whose size falls between 3.12 cm. and 3.2 cm. **5**

[ z = 1.2, A = 0.3849 ; z = 2.0, A = 0.4772]

SECTION – II

7. a) With usual notations establish the following : **9**

   i) $\delta^2 y_5 = y_6 - 2y_5 + y_4$

   ii) $y_4 = y_3 + \Delta y_2 + \Delta^2 y_1 + \Delta^3 y_1$

   iii) $\nabla\Delta = \Delta - \nabla = \delta^2$

   b) Evaluate $\int_0^1 e^{-x^2} dx$ taking $h = \frac{1}{6}$ by using **8**

   i) Trapezoidal rule

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

   iii) Simpson's $\frac{3}{8}$ rule

OR

8. a) Use Stirling's formula to find $u_{35}$, given **8**
   $u_{10} = 600$, $u_{20} = 512$, $u_{30} = 439$, $u_{40} = 346$, $u_{50} = 243$.

   b) For the following tabulated data **9**

| **x** | 15 | 17 | 19 | 21 | 23 | 25 |
|---|---|---|---|---|---|---|
| **y =** $\sqrt{x}$ | 3.873 | 4.123 | 4.359 | 4.583 | 4.796 | 5.000 |

   Find $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$ at x = 16. Compare the result with exact values.

9. a) Using Newton - Raphson iterative method find a root of the equation $x \sin x + \cos x = 0$ which is near to $x = \pi$. Write the algorithm for the method used. **9**

   b) Use method of least squares to fit a second degree parabola of the form $y = ax^2 + bx + c$ to satisfy the following data : **8**

| **x** | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|
| **y** | –5 | –2 | 5 | 16 | 31 | 50 | 73 |

OR

10. a) Solve the following system of equations by Gauss - Seidel iterative method **8**

$27x_1 + 6x_2 - x_3 = 85$

$6x_1 + 15x_2 + 2x_3 = 72$

$x_1 + x_2 + 54\, x_3 = 110$

b) Use Runge - Kutta method of fourth order to solve **9**

$$\frac{dy}{dx} + \frac{y}{x} = \frac{1}{x^2} \; ; \; y(1) = 1$$

to find y at x = 1.2 taking h = 0.1. Write the computer algorithm for the above method.

11. a) Given the values of u (x, y) on the boundary of the square in Fig.11.a, evaluate the function u (x, y) satisfying Laplace equation $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$ at the pivotal points. **8**

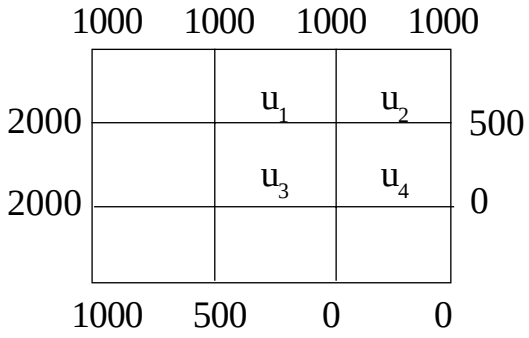


Fig 11.a

b) Solve the following Linear programming problem by Simplex method. **8**

Maximize : $Z = 4x_1 + 3x_2 + 6x_3$,

Subject to $2x_1 + 3x_2 + 2x_3 \leq 440$,

$4x_1 + 3x_3 \leq 470$,

$2x_1 + 5x_2 \leq 430$,

$x_1, x_2, x_3 \geq 0$.

OR

12. a) Solve the equation $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = -500$ for pivotal values on a square plate bounded by x = 0, y = 0, x = 3, y = 3 and u = 0 at the every point on the boundary of square plate. **8**

b) Solve the following Linear programming problem by Simplex method. **8**

Minimize : $Z = 5x_1 + 3x_2$,

Subject to $x_1 + x_2 \leq 2$,

$5x_1 + 2x_2 \leq 10$,

$3x_1 + 8x_2 \leq 12$,

$x_1, x_2 \geq 0$.

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**[3863] – 150 - A**

# T.E. (Computer Engineering) (Semester - II) Examination, 2010
# MICROPROCESSOR BASED SYSTEMS
# (1997 Course) (Old)

Time : 3 Hours Max. Marks : 100

***Instructions :*** *i) Answer **any three** questions from **each** Section.*
*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 – 1

1. a) Draw memory map of 8051 microcontroller, clearly showing bit addressable internal RAM area.How many SFRs are bit addressable ? **8**
   b) Explain timer and counter operations of timers/counters in 8051**.** **4**
   c) Explain the different flags available in PSW of 8051. **4**

2. Answer the following:
   a) Differentiate between real mode and V86 modes of 80386DX. **6**
   b) What are TRAP, FAULT and ABORT? **6**
   c) What are the activities performed by 80386 on reset? **4**

3. a) What do you mean by system descriptors and non-system descriptors? Give details with the help of descriptor format. **8**
   b) What is the minimum and maximum segment size in protected mode of 80386DX? How do you vary the segment size ? **4**
   c) What are the various protection checks performed by segmentation unit of 80386 ? **6**

4. a) What are the different means of changing Privilege level? How it is different in each case? **8**
   b) What is LDT ? How it is useful in address translation ? Explain in detail. **8**

**P.T.O.**

5. a) What is dynamic bus sizing in 80386DX? **4**

   b) What are aligned and misaligned data transfers? **6**

   c) Name and explain the signals used to interface 80387 with 80386DX processor. **6**

## SECTION – II

6. a) Design a 8051 based microcontroller card with following specifications: **12**

      1) 4KB EPROM

      2) 16KB SRAM

      3) 8255 PPI

      Draw neat interface diagram clearly showing all the support chips.Also draw memory map showing address range for all the memory chips and I/O.

   b) What are the functions of $\overline{ADS}$ and $\overline{NA}$ pins? **4**

   c) Name the power savings mode of 8051. **2**

7. a) With the help of neat diagram, explain the logical to linear address translation in 80386DX. Give details. **10**

   b) What are the privileged instructions in 80386 processor? Who can execute these? **6**

8. a) Explain the interrupt structure of 8051. Give details of different SFRs involved in interrupt handling. **8**

   b) What are the addressing modes of 8051 microcontroller? Give two examples for each addressing mode. **8**

9. a) What are nested tasks in 80386DX? Give details. **6**

   b) What is TSS (Task State Segment) ? How TSS is helpful in multitasking ? **10**

10. a) How interrupts handled in real mode 80386? Will it be different, if mode changed to protected mode? Explain in detail. **10**

    b) What are GDTR, LDTR and IDTR? Mention their use. **6**

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**[3863] – 10**

# T.E. (Civil) (Semester – II) Examination, 2010
## 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) Answers to the **two** Sections should be written in **separate** books.*

*3) Neat diagrams must be drawn **wherever** necessary.*

*4) Figures to the **right** indicate **full** marks.*

*5) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is **allowed**.*

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

SECTION – I

1. a) Explain the ideal requirement of the permanent way. **6**

   b) State the reasons for the preference of flat-footed rails. **5**

   c) Compare railway transportation with road transportation and mention characteristics of Railway transportation. **5**

OR

2. a) Give classification of Indian Railway lines for B.G. routes. **6**

   b) What is the ballast in permanent way ? Mention the functions of ballast and state the requirements of a good ballast material. **5**

   c) Describe the functions and requirements of rails in a Railway track. **5**

3. a) With the aid of a neat sketch, explain the overriding and under cut switches. **6**

   b) Explain with sketch superelevation and negative superelevation. State the maximum permissible value for cant, cant excess and cant deficiency. **6**

   c) If an 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 60 KMPH. **6**

OR

4. a) Explain the necessities of gradients. Discuss all the types of gradients giving their permissible values adopted on Indian railways. **6**
   b) Explain : SWR, LWR and CWR. **6**
   c) Draw a neat labeled sketch of a left hand turnout, showing all the elements there in. **6**

5. Write short notes on : **16**
   i) Sky bus
   ii) Metro rails
   iii) Buffer stops
   iv) Scotch block.

OR

6. Write short notes on : **16**
   i) Measured Shovel Packing (MSP)
   ii) Ballast profile for high speed track
   iii) Warner and outer signals.
   iv) Tram line method of plate laying.

SECTION – II

7. a) Explain needle beam method with sketch. **6**
   b) Explain how alignment of Tunnel through shaft can be transferred. Draw sketches. **6**
   c) Explain with sketches on what factors size and shape of tunnel depend. **6**

OR

8. a) Write advantages and disadvantages of tunnels with respect to open cuts. **6**
   b) What are portals ? What are the points to be observed and carefully considered in the design and construction of portals ? **6**
   c) Explain with neat labeled sketches heading and benching method of tunneling. **6**

9. a) Explain difference between shotcreting and rockbolting. Write explanatory note on shotcreting or rock bolting. **6**
   b) What is mucking ? Explain various mucking facilities in tunnels. **6**
   c) Explain concept of drilling pattern. **4**

OR

10. Write short notes on : **16**
    i) Cherry picker method for mucking
    ii) California crossing method
    iii) Necessity of dust suppression and requirements of ventilating system
    iv) Immersed tubes.

11. Explain the following with sketch : **16**
    i) Fender (any one)
    ii) Floating dock
    iii) Marine railway
    iv) Breakwater (any one).

OR

12. Explain difference between : **16**
    i) Slipway and Dry dock
    ii) Tribar and Tetra-pod
    iii) Commercial harbour and Fishery harbour
    iv) Jetty and Wharf.

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**[3863] – 103**

# T.E. (Chemical) (Semester – I) Examination, 2010
# 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) 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) Define instrumentation and explain the purpose of instrumentation in chemical process industries. **6**

   b) Describe the classification of instruments in detail. **8**

   c) Differentiate between analog and digital instruments. **4**

OR

2. a) Explain static and dynamic characteristics of measuring instruments. **8**

   b) Evaluate the temperature at which Fahrenheit and Centigrade Scale coincide. **6**

   c) Explain the importance of instrumentation the process industries. **4**

3. a) Describe the operating principle, construction and working of radiation pyrometer. **8**

   b) Explain working of industrial mercury in glass thermometer, with the help of a neat diagram. **8**

OR

4. a) Write short notes on : **8**

   1) Themister 2) RTD

   b) Explain seebeck effect and its application in working of a temperature measuring instrument. Name the instrument with its working diagram. **8**

**P.T.O.**

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 gauge. **8**

SECTION – II

7. a) Explain the principle, construction and working of Orifice meter. **8**

   b) Discuss Pitot Tube in detail. **8**

OR

8. a) Describe the principle, construction and working of electromagnetic flow meter. **10**

   b) Describe Coriolis flow meter. **6**

9. a) Explain construction and working of Bubbler method and its application. **8**

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

      1) Bob and tape method  2) Air purge method

OR

10. a) Explain with neat diagram, air trap system 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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**[3863] – 12**

# T.E. (Mechanical) (Semester – I) Examination, 2010
## HEAT TRANSFER (Common with Mech. S/W for Semester – II)
## (2003 Course)

Time : 3 Hours 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) 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) Describe the mechanism of heat conduction. Define thermal conductivity and discuss factors affecting it. Differentiate between isotropic and anisotropic materials giving one example of each. **8**

   b) Air at 20°C blows over a 50 cm × 75 cm hot plate maintained at 250°C. The film heat transfer coefficient is 50 $W/m^2K$. 300 W is being lost from the plate surface by radiation. Calculate heat transfer rate and other side plate temperature. Thermal conductivity of plate material is 43 W/mK and the plate is 2 cm thick. **8**

OR

2. a) Write three dimensional heat conduction equation in Cartesian coordinate for anisotropic material for unsteady state condition, and reduction to Fourier equation, Laplace equation and Poisson's equation. **6**

   b) A square plate heater (size 15 cm × 15 cm) is inserted between two slabs, slab A is 2 cm thick (k = 50 W/mK) and slab B is 1 cm thick (k = 0.2 W/mK). The outside heat transfer coefficient on both sides of A and B are 200 and 50 $W/m^2K$ respectively. The temperature (temp) of surrounding air is 25°C. If the rating of heater is 1 kW, find :

   i) maximum temperature in the system

   ii) outer surface temperature of the two slabs

   iii) draw equivalent electrical circuit of the system. **10**

**P.T.O.**

3. A cylindrical fuel element of nuclear reactor generates heat according to law $q_g(r) = q_o[1 – (r/R)^2]$, where R is outer radius of fuel element and $q_o$ is the heat generation rate at centre in $W/m^3$.
   i) Assuming one dimensional steady state heat flow, develop a relation for temperature drop from the centre to surface of the fuel element.
   ii) Find the expression for heat flow at the surface.
   iii) If the heat generated at centre is $1.6 \times 10^8$ $W/m^3$ and outside radius of fuel element is 1 cm and thermal conductivity is 10 W/mK, find temperature drop from centre to surface.
   iv) If the heat reaching the surface is dissipated to a cooling medium at 50°C having heat transfer coefficient of 10000 $W/m^2K$, find the surface temperature of fuel element. **16**

OR

4. a) What is the purpose of insulation ? Explain significance of critical radius of insulation. Derive an expression for critical radius of insulation for cylinder using standard notations. **7**
   b) Write short notes on the following :
      i) Economic thickness of insulation
      ii) Variation of thermal conductivity with temp in solids, liquids and gases
      iii) Thermal contact resistance. **9**

5. a) Define time constant for a system. What do you understand by response time of a temperature measuring instrument ? What is the relation between time constant and time for getting response with 95% accuracy ? **8**
   b) Thin fins of brass (k = 119.4 W/mK) are welded longitudinally on a 5 cm brass cylinder which stands vertically and is surrounded by air at 35°C with $h = 17$ $W/m^2K$. If 12 uniformly spaced fins are used, each 0.76 mm thick and extending 1.27 cm radially outward from the cylinder, find heat transfer rate from finned cylinder when its surface is maintained at 140°C. **10**

OR

6. a) Derive the formula for rate of heat transfer, efficiency and effectiveness for a fin with negligible heat dissipation from tip. **10**

b) Two identical balls of pure iron and copper having diameter of 6 cm and at initial temperature of 500°C are being cooled in oil having temperature of 100°C and heat transfer coefficient of 10 $W/m^2K$. It is desired that both balls should reach a temperature of 150°C at the same time. Which ball should be put in the oil first ? After how much time, other ball should be put in oil ? Justify the answer and formula used. Use following properties :

Iron – Density = 7897 $kg/m^3$, K = 73 W/mK, Cp = 0.452 kJ/kgK

Copper – Density = 8954 $kg/m^3$, k = 386 W/mK, Cp = 0.383 kJ/kgK. **8**

SECTION – II

7. a) A pipe carrying steam runs in a large room and is expressed to air at a temperature of 30°C. The pipe surface temperature is 200°C. The pipe diameter is 20 cm. If the total heat loss from the pipe per meter length is 1.9193 kW/m, determine the pipe surface emissivity.

Use correlation $Nu = 0.53 (Gr\ Pr)^{1/4}$

and properties of air at 115°C : $k_f = 0.03306\ W/m^2K$, $\upsilon = 24.93 \times 10^{-6}\ m^2/s$

Pr = 0.687. **8**

b) Differentiate between internal flow and external flow. **4**

c) Explain the term convective heat transfer coefficient and its relation with thermal boundary layer thickness. **4**

OR

8. a) Air at 20°C is flowing along a heated plate at 134°C with a velocity of 3 m/sec. The plate is 2 m long. Heat transferred from first 40 cm from the leading edge is 1.45 kW.

Determine width of the plate. Properties of air at 77°C are :

Density = 0.998 $kg/m^3$, kinematic viscosity = $20.76 \times 10^{-6}\ m^2/s$, Cp = 1.009 kJ/kg K, k = 0.03 W/mK. Use following correlation. **8**

$Nu_x = 0.332\ Re^{0.5}\ Pr^{0.33}$

b) Explain physical significance of the following dimensionless numbers :

Re, Nu, Pr, Gr **8**

9. a) Derive expression of Stefan Boltzmann Law from Planck's distribution law. **6**

   b) Determine i) the wavelength at which the spectral emissive power of a tungsten filament at 1400 K is maximum, ii) the spectral emissive power at that wavelength iii) the spectral emissive power at 5 μm . Assume black body radiation function as 0.8081. **6**

   c) Define the term irradiation and radiosity. Establish a relationship between them. **4**

OR

10. a) Derive an expression for a rate of radiation exchange, when a radiation shield is inserted between two large parallel plates. **8**

    b) Define radiation view factor. Write expressions of view factor relations. Calculate the view factor between two opposite sides of a hollow cube, if view factor between two adjacent sides of it is 0.2. **8**

11. a) Draw the temperature profiles of hot and cold fluids in following types of heat exchangers :
    i) Condenser
    ii) Boiler
    iii) Cross-flow (both fluids unmixed) heat exchanger
    iv) Very long length parallel flow heat exchanger
    v) Counter flow heat exchanger for fluids with same capacity rate. **10**

    b) A double pipe heat exchanger is made of stainless steel (k = 15 W/mK) with inner diameter of inner tube = 1.5 cm and outer diameter of inner tube = 1.9 cm. The inner diameter of outer pipe = 3.2 cm.

    $h_i$ = 800 W/m$^2$K and $h_0$ = 1200 W/m$^2$K

    Fouling factor on inner tube surface = 0.0004 m$^2$ K/W

    Fouling factor on outer tube surface = 0.0001 m$^2$ K/W

    Determine :
    i) Thermal resistance of the heat exchanger per unit length.
    ii) Percentage of thermal resistance due to fouling as compared to the total thermal resistance.
    iii) Overall heat transfer coefficient based on inner surface area of inner tube. **8**

OR

12. a) Derive the expression for average heat transfer coefficient for laminar film condensation on a vertical plate. **10**

    b) Discuss pool boiling curve. What is the significance of critical heat flux in design of evaporators ? **8**

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**[3863] – 123**

# T.E. (Petrochemical) (Semester – I) (2003 Course) Examination, 2010
## DIFFUSION AND MASS TRANSFER

Time : 3 Hours 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 stream tables is **allowed**.*
*6) Assume suitable data, **if necessary**.*

SECTION – I

1. Answer the following questions in brief : **18**
   a) Explain molecular and eddy diffusion by giving suitable examples.
   b) Describe a method to estimate the diffusivity of a volatile solvent into air.
   c) Explain with suitable graph the typical rate of drying curve.
   d) What is the significance of the j-factors for momentum, heat and mass transfer ?

OR

2. a) A gas of carbon dioxide and air is contained in a tube at 101.32 kPa pressure and 44° C. At one point the partial pressure of $CO_2$ is $P_{A1}$ = 58.21 kPa and at a point 0.035 m distance away, $P_{A2}$ = 18.76 kPa. If the total pressure is constant throughout the tube, calculate the flux of $CO_2$ at steady state. **9**
   b) Gas A is diffusing from a gas stream at point 1 to a catalyst surface at point 2 and reacts instantaneously and irreversibly as follows : $2A \rightarrow B$ . Gas B diffuses back to the gas stream. Derive the final equation for NA at constant pressure P and steady state in terms of partial pressure. **9**

3. a) A 0.20-m-long test tube was used to study the diffusion process in which liquid A diffuses into gas B. In one study the level of liquid A was initially 0.1 m below the top of the tube. The temperature was 25° C and the total pressure was maintained at 1 atm. The molar flux of component A at the top of the test tube was found to be $1.6 \times 10^{-3}$ kgmol/$m^2$.h. Find the diffusion coefficient for A into gas B. Assume that gas B is insoluble in liquid A. The partial pressure of A at the surface of the liquid was 0.06 atm. **8**

**P.T.O.**

b) Solve the following : **8**

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

ii) Prove that $J_A + J_B = 0$.

OR

4. 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 2.0% $H_2S$, 4.0% $SO_2$ and 94.0% 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. **8**

b) $H_2$ gas flows through a tube of neoprene rubber having ID = 30 mm and OD = 55 mm. The pressure and temperature of the gas are 3 std. atm. pressure and 298 K respectively. If the solubility of hydrogen in rubber is $S = 55 \times 10^{-3}$ $\frac{m^3(NTP)}{m^3 \cdot rubber \cdot atm.}$ and diffusivity of $H_2$ through rubber $D_{AB} = 1.8 \times 10^{-10}$ $m^2$/sec.

Calculate rate of $H_2$ loss per unit length of tube due to diffusion. **8**

5. a) A hailstone falling freely through the atmosphere grows by transfer of water vapor from the surrounding air saturated with water vapor. Estimate the mass transfer coefficient ($k_c$) for a 3-cm diameter hailstone falling at a Reynolds number of $4 \times 10^4$. Assume air temperature to be –10 C.

Use the following mass transfer coefficient correlation for this type of phenomenon : [$Sh\ Sc^{-0.33} = 0.51\ Re^{0.5} + 0.02235\ Re^{0.78}$]. **8**

b) Discuss the theories of mass transfer proposed by various coworkers to study interphase mass transfer phenomena. **8**

OR

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

$$\frac{hd}{k} = 2 + 0.6\left(\frac{d^3\rho^2 g\beta\beta\Delta}{\mu^2}\right)\left(\frac{c_p\mu}{k}\right)^{1/3} \quad \text{for } Gr^{1/4}\ Pr^{1/3} < 200$$

where d is the diameter of the sphere and the fluid properties are evaluated at the mean temperature of the sphere and bulk fluid. Using the analogy between mass and heat transfer, calculate the instantaneous rate of sublimation at the surface of a naphthalene sphere in air at 145.5° C and 1 atm. Explain the analogy between Nu = Sh, Sc = Pr, Gr = $Gr_{AB}$.

Data :

$P^{vap}_{naphthalene}$ = 0.13 atm, $D_{AB} = 5.85 \times 10^{-6}$ $m^2/s$, $d = 7.5 \times 10^{-2}$ m

$\rho_{air} = 0.839$ kg/$m^3$, $\mu_{air} = 2.3 \times 10^{-5}$ kg/m.s. **8**

b) Develop the material balance equations for counter current mass transfer process by giving the graphical representations of the final equation. **8**

SECTION – II

7. 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/$m^2$) × $10^6$** |
|---|---|
| 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/$m^2$) and the molar concentration in the liquid phase $C_{A1}$ (kmol/$m^3$) is given by : $P_A = 25\ C_A$. **16**

OR

8. a) Calculate the value of Mass transfer coefficient and flux of mass transfer from a sphere of naphthalene to air at 45° C and 1 atm flowing at velocity of 0.4 m/s. The diameter of sphere is 25.4 mm. The diffusivity of naphthalene in air at 45° C is $6.92 \times 10^{-6}$ $m^2/s$ and vapor pressure of solid naphthalene is 0.55 mm of mercury.

Data : $\mu = 1.93 \times 10^{-5}$ Pa.s, $\rho = 1.113$ kg/$m^3$

You may use the following correlation :

$Sh = 2 + 0.552\ Re^{0.53} + Sc^{0.33}$

Where, $Sh = K'_c \dfrac{d_P}{D_{AB}}$. **10**

b) Bromine is being rapidly dissolved in water. Its concentration is about half saturated in 3 minutes. Predict the mass transfer coefficients. **6**

9. A solid disc of benzoic acid 2.5 cm in diameter is spinning at 20 r.p.m. 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 $1 \times 10^{-5}$ $cm^2$/sec. in water and 0.233 cm/sec. in air. The solubility of water is 0.003 gm/$cm^3$, its equilibrium vapour pressure is 0.30 mm Hg.

   You may use following correlation to find mass transfer coefficient :

$$k = 0.62 D \left( \frac{\omega}{\nu} \right)^{1/2} \left( \frac{V}{D} \right)^{1/3} .$$ **16**

OR

10. a) Discuss the theory of wet-bulb thermometry. Under what conditions the wet-bulb temperature and adiabatic saturation temperature will be identical ? **8**

    b) Discuss the significance and application of psychometric charts in simultaneous heat/mass transfer operations. **8**

11. a) Drying of a food product is carried out in an insulated tray. The drying air has a partial pressure of water equal to 2360 Pa and a wet bulb temperature of 30° C. The product has a drying surface of 0.05 $m^2$/kg dry solid. The material has a critical moisture content of 0.12 (dry basis) and negligible equilibrium moisture content. The drying rate in the falling rate period is proportional to the moisture content and the mass transfer coefficient is $5.34 \times 10^{-4}$ kg/$m^2$.hr.Pa.

    Calculate :

    a) the drying rate in the constant rate period in kg/$m^2$ hr.

    b) the time required to dry the material from a moisture of 0.22 to 0.06 (both on dry basis). **18**

OR

12. Explain the following terms : **18**

    a) Free-moisture content

    b) Equilibrium-moisture content

    c) Unbound moisture

    d) Bound moisture.

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**[3863] – 130**

# T.E. (Petrochemical) (Semester – II) Examination, 2010
# PROCESS EQUIPMENT DESIGN
# (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) **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) Discuss in details about 'General procedure for Process Equipment design. **8**

   b) What are the different fabrication methods used in Chemical Equipment design and discuss any two with neat sketches. **8**

OR

2. a) What are the techniques to reduce the stress concentration ? **6**

   b) What are the important factors for selection of material for process equipment design ? **6**

   c) Differentiate between Mechanical Design and Process Design. **4**

3. a) A flat belt is required to transmit 30 KW from a pulley of 1.5 M effective diameter running at 300 rpm. The angle of contact is spread over 11/24 of the circumference. The coefficient of friction between belt and pulley surface is 0.3. Determine taking centrifugal tension in account, width of the belt required. If it is given that belt thickness is 9.5 mm, density of its material is 1100 kg/$m^3$ and related permissible working stress is 2.5 MPa. **10**

   b) Design a cast iron protective type flange coupling to transmit 15 kW at 900 rpm from an electric motor to a compressor. The service factor may be assumed as 1.35. The following permissible stresses may be used : **8**
   Shear stress for shaft, bolt and key material = 40 MPa
   Crushing stress for bolt and key = 80 MPa
   Shear stress for cast iron = 8 MPa
   Width of key = 12 mm & number of bolts = 3.

OR

**P.T.O.**

4. a) Design a cast-iron protective type flange coupling to connect shafts in order to transmit 15 hp at 500 rpm. The following permissible stresses may be used.

   Shear stress for shaft, bolt and key material = 400 KgF/cm$^2$

   Crushing stress for bolt and key = 800 KgF/cm$^2$

   Shear stress for cast iron = 80 KgF/cm$^2$. **10**

   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 : **8**

   a) Maximum Normal Shear Stress Theory
   b) Maximum Shear Stress Theory
   c) Maximum Principal Strain Theory
   d) Maximum Strain Energy Theory

5. a) Internal pressure of a thin vessel diameter 1.5 m is 2 N/mm$^2$. **6**

   Find minimum wall thickness if :

   a) The circumferential stress does not exceed 40 MPa.
   b) The Longitudinal stress does not exceed 30 MPa.

   Assume Joint Efficiency J = 1.

   b) Calculate thickness of shell subjected to external pressure of 0.35 N/mm$^2$. **10**

   Data :

   Internal Diameter = 2200 mm, Internal Pressure = 0.6 N/mm$^2$

   Length of vessel = 2400 mm, Permissible stress of material =130 N/mm$^2$

   E = $210\times10^3$ N/mm$^2$, Poisson's Ratio = 0.3.

   Number fo stiffeners = 4 and Joint efficiency = 85%

   Calculate the stresses develop in shell if half coil jacket of internal diameter 120 mm is used. Material is same as of shell.

   OR

6. Write short notes on following (**any four**) : **16**

   a) Codes and standards
   b) Factor of safety
   c) Nozzle compensation
   d) Types of belt drives and their selection criteria
   e) Pressure relief valve and rupture disc.

SECTION – II

7. a) Calculate the shell diameter and Nozzle thickness of shell and tube heat exchanger : **10**
Data :
Permissible stress = 95 $N/mm^2$
No. of Passes = 2
No. of Tubes = 54 (with 2 pass U-Bundle)
Spacing between tubes = 2.5 cm (Square pitch)
B = 0.7
Joint Efficiency = 85%
Pressure = 0.5 $N/mm^2$
Nozzle inlet and outlet diameter = 75 mm

b) Enlist the process parameter useful in mechanical design of Heat Exchanger. **6**

OR

8. a) Discuss Fouling in Heat exchanger in details. What are the consequences of fouling ? **8**

b) For the heat exchanger data find out diameter and thickness of shell. **8**
Data :
i) Number of tubes = 64
ii) Number of passes = 2
iii) Outside diameter of tube = 20 mm
iv) Pitch (square) = 25 mm
v) Proportionality factor ($\beta$) = 0.8 (Triangular Pitch)
E= 0.7 (Square Pitch)
vi) Internal shell pressure (Pi) = 0.55 $N/mm^2$
vii) Material is Carbon Steel
viii) Permissible stress of the material = 130 $N/mm^2$
ix) Welding efficiency = 85%
Also find the diameter of shell if triangular pitch is selected.

9. a) What are the different losses that can occur in storage tank ? Explain the breathing loss in details. **6**

b) Discuss the design of flat bottom cylindrical storage tanks. What are the formulae used to get the shell thickness at different height. Also mention the plate thickness for bottom plates of this cylindrical tank. Also give design of conical roof with considering slope 1 in 5. **10**

OR

10. a) Shell and bottom plate of Circular Cylindrical Tank for **12**

Storage of crude oil with conical roof

Tank diameter = 20 m (Approx)

Tank height = 12 m (Approx)

Material carbon steel with permissible stress = 142 $N/mm^2$

Joint efficiency = 85%

Superimposed load = 1250 $N/m^2$

Density = 7.7

Plate size available are

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

b) Discuss various types of floating roofs in Storage Tanks. **4**

11. a) Design an agitator on the basis of critical speed of shaft with the help of neat sketch. **6**

b) What is function of agitator ? State different types of agitator. Explain any one agitator in detail with neat sketch. **6**

c) Explain the design consideration for designing shaft of agitator. **6**

OR

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

a) Pipeline Design considerations

b) Baffles and its need for mixing

c) Critical speed of shaft

d) ASME and TEMA CODES

e) Different types of condensers and evaporators.

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**[3863] – 132**

**T.E. (Polymer) (Semester – I) Examination, 2010**
**POLYMER CHEMISTRY – I**
**(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) Derive Carothers equation and show how it is useful in predicting gel point in condensation polymerisation. **8**

   b) Classify polymeric materials in as many ways as possible. **8**

OR

2. a) Write the chemical structure and repeat unit in the following cases :
   i) Polymethyl methacrylate
   ii) Polystyrene
   iii) Polytetra fluoroethylene
   iv) Polyisoprene. **8**

   b) Define functionality. Comment on functionality of the following :
   i) Ethylene glycol
   ii) Maleic acid
   iii) Vinyl chloride
   iv) Glycerol. **8**

**P.T.O.**

3. a) Define various molecular weight averages used to characterise polymers. Why concept of average molecular weight is needed in case of polymers ? **9**

   b) Describe any one method for determination of molecular weight of a polymer in detail. **9**

OR

4. a) Based on the following data : **9**

| Fraction | Wt. Fraction | M.W. |
|---|---|---|
| A | 0.80 | 34,000 |
| B | 0.07 | 2,50,000 |
| C | 0.03 | 1,70,000 |
| D | 0.05 | 3,80,000 |
| E | 0.05 | 4,00,000 |

Calculate $\overline{M}_n$, $\overline{M}_w$ and polydispersity index.

   b) Explain end group analysis in detail, illustrate with suitable example. **9**

5. a) Explain the concept of polydispersity and polymer molecular weight distribution. Can polydispersity be less than one ? **8**

   b) Draw the graph for molecular weight distribution of two hypothetical polymers having same $\overline{M}_n$ but different polydispersity index. **4**

   c) What is Mark Howink equation, give its significance ? **4**

OR

6. a) Write a short note on gel permeation chromatography. **6**

   b) How molecular weight distribution affects melt viscosity, tensile strength and impact strength of a polymer ? **6**

   c) Write an informative note on membrane osmometry. **6**

SECTION – II

7. a) Give five points of comparison between bulk, suspension, solution and emulsion polymerisation. **10**

   b) Explain in brief the following :

      i) Plasma polymerisation

      ii) Phase transfer catalyst. **6**

OR

8. Justify the following statements :
   i) In emulsion polymerisation the monomer droplet works as a reservoir.
   ii) It is difficult to get high molecular weight by solution polymerisation.
   iii) During condensation polymerisation removal of by products is essential.
   iv) Anionic polymerisation is also known as living polymerisation.
   v) Polymers can be crosslinked by various modes.
   vi) Increasing initiator concentration in bulk polymerisation generally decreases the molecular weight. **16**

9. a) Discuss different types of initiators used for free radical polymerisation, with examples. **8**
   b) How inhibitors are removed on laboratory scale ? Give one example of an inhibitor. **5**
   c) Enlist and explain the sources which initiate the decomposition of initiators. **5**

OR

10. a) Describe the effect of retarders, inhibitors and chain transfer agents on rate of polymerisation. **6**
   b) Explain in brief the following : **6**
      i) Melt polycondensation
      ii) Solid phase polymerisation.
   c) Give mechanism of : **6**
      i) Cationic polymerisation
      ii) Anionic polymerisation.

11. a) Derive an expression for kinetics of condensation polymerisation with or without catalyst. **10**
   b) What is gelation and gel point ? **6**

OR

12. a) Explain ring opening polymerisation with suitable example. **6**
   b) Explain polyaddition polymerisation. **5**
   c) What is the need for stoichiometric control in condensation polymerisation ? **5**

**[3863] – 15**

# T.E. (Mech.) (Semester – I) Examination, 2010
# COMPUTER ORIENTED NUMERICAL METHODS
## (Common with Mech.S/W for Semester – 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) Black figures to the **right** indicate **full** marks.*
*5) Assume suitable data, if **necessary**.*

SECTION – I

UNIT – 1

1. A) Using Simplex method, maximize the following :

$z = -x_1 + 3x_2 - 2x_3$

subject to, $3x_1 - x_2 + 3x_3 \leq 7$

$-2x_1 + 4x_2 \leq 12$

$-4x_1 + 3x_2 + 8x_3 \leq 10$

$x_1, x_2, x_3 \geq 0$ **12**

B) Define with one example each :
i) Truncation error
ii) Round-off error
iii) Relative error. **6**

OR

2. A) Heat flow rate due to radiation is given by Stefan-Boltzmann's law as follows :

$q_{rad} = \sigma A \in T^4$, where,

$\sigma = 5.67 \times 10^{-8}$ W/m$^2$k$^4$

$\in = 0.8$

A = Surface area of a rectangular plate with length '*l*' m and width 'b' m.

T = Absolute temp. of the plate

Calculate the error caused in calculation of $q_{rad}$ if measurements of *l*, b and T are made as follows :

$l = (3 \pm 0.0002)$ m

$b = (2 \pm 0.0001)$ m

$T = (800 \pm 0.01)$ k **10**

**P.T.O.**

B) Define and explain :

i) Basic variables

ii) Slack variables

iii) Objective function

iv) Linear programming model. **8**

UNIT – 2

3. A) The deflection of a cantilever beam from its original position at different locations on the beam is as follows :

| **x (location in 'cm')** | 0 | 2 | 4 | 6 |
|---|---|---|---|---|
| **d (deflection in 'mm')** | 0 | 0.1 | 0.17 | 0.28 |

Find out the location (value of x) at which deflection d = 0.15 mm. **8**

B) Write a program for fitting a straight line using least square technique, through given points ('n' in no.) as, $(x_1y_1)$ ... $(x_n, y_n)$. **8**

OR

4. A) Fit a curve of type $PV^n = C$ to the following data

| V ($m^3$) | 0.003 | 0.005 | 0.015 | 0.025 |
|---|---|---|---|---|
| P(bar) | 10 | 7 | 3 | 1 |

**8**

B) Write a flow-chart for Lagrange's interpolation method to find the value of '$y_k$' for given '$x_k$' if 'n' no. of data points, viz $(x_1, y_1)...(x_n, y_n)$ are given. **8**

UNIT – 3

5. A) The distance travelled by a particle at different time instants is given below. Using Newton's forward difference differentiation method, calculate its velocity at t = 7 sec.

| **t(sec)** | 0 | 5 | 10 | 15 | 20 |
|---|---|---|---|---|---|
| **S(m)** | 0 | 10 | 35 | 70 | 120 |

**8**

B) Explain the LU. Decomposition method to solve 'n' no. of linear simultaneous equations in 'n' unknowns.

(Only step-by-step procedure is expected. No flow-chart/program is expected). **8**

OR

6. A) A slender metal rod subject to temperature variation along its length results in the following equations, indicating the temperature distribution.
$4T_1 + 2T_2 = 80$
$3T_1 + 4T_2 + 2T_3 = 170$
$3T_2 + 4T_3 + 2T_4 = 260$
$3T_3 + 4T_4 = 250$
Calculate the temperatures $T_1$, $T_2$, $T_3$ and $T_4$ using Gauss-Jordan method. **8**

B) Write a flow-chart for backward difference differentiation procedure if 'n' no of data points are given. **8**

SECTION – II
UNIT – 4

7. A) Solve by simple iteration (successive approximation) method with accuracy criterion as 0.01 and initial guess as 0.5. $x = \frac{\cos x}{e^x}$. **8**

B) The velocity of a car measured at different time instants is as follows :

| **Time (sec)** | 0 | 2 | 4 | 6 | 8 | 10 | 12 |
|---|---|---|---|---|---|---|---|
| **Velocity (m/s)** | 0 | 3 | 6 | 15 | 25 | 40 | 60 |

Using Simpson's $3/8^{th}$ rule, calculate the distance travelled by the car in 12 seconds. Also draw the flow chart for the same. **8**

OR

8. A) Calculate $\int_2^4 \frac{dx}{1+x^2}$ using Gauss-Legendre 2 point formula. **8**

B) Solve the following equation using Newton Raphson method with initial guess value as 0.8 and accuracy criterion as 0.01
$x^3 - x^2 - x + 1 = 0$
Explain the limitations of Newton-Raphson method with simple sketches. **8**

UNIT – 5

9. A) $\frac{dy}{dx} = \frac{(1+x^2)y^2}{2}$

| **x** | **y** |
|---|---|
| 0 | 1 |
| 0.1 | 1.06 |
| 0.2 | 1.12 |
| 0.3 | 1.21 |

Evaluate 'y' at x = 0.4 by Milne's predictor-corrector method. **8**

B) Draw a flow-chart for finding solution of a differential equation $y' = f(x, y)$ using modified Euler's method. **8**

OR

10. A) Solve the following differential equations simultaneously :

$$\frac{dy}{dx} = 2y + z \qquad \frac{dz}{dx} = y - 3z$$

$y(0) = 0$

$z(0) = 0.5$

Find y (0.1) and z(0.1) using Runge-Kutta method. Take h = 0.1. **8**

B) Draw a flow-chart for solution of a differential equation using Taylor's series method. **8**

UNIT – 6

11. A) Solve $\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2}$ using explicit (Schmidt method).

At x = 0 and x = 0.5, u = 1 for all values of 't'

At t = 0, u = 2x + 1 for $0 \leq x \leq 0.5$

Take increment in 'x' as 0.1 and increment in 't' as 0.01.

Find all values of 'u' for t = 0 to t = 0.02. **10**

B) Draw flowchart for solving hyperbolic partial differential equation $\frac{\partial^2 f}{\partial x^2} = \frac{\partial^2 f}{\partial t^2}$. **8**

OR

12. A) Solve the following eq$^n$ :

$$\frac{\partial^2 u}{\partial x^2} = \frac{\partial^2 u}{\partial t^2}$$

At t = 0, u = sin2x $0 \leq x \leq 0.5$

At x = 0 and x = 0.5, u = 1 for all values of 't'.

Find the values of 'u'

at t = 0.03 for x = 0 to x = 0.5

Take $\Delta x = 0.1$ and $\Delta t = 0.01$ **10**

B) Draw flow chart for sol$^n$ of Laplace eq$^n$, i.e. $\frac{\partial^2 T}{\partial x^2} + \frac{\partial^2 T}{\partial y^2} = 0$. **8**

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**[3863] – 157**

# T.E. (Information Technology) (Semester – II) Examination, 2010
## (2003 Course)
## MANAGEMENT INFORMATION SYSTEMS

Time : 3 Hours 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 Information System ? Explain various activities performed in information system. **8**

   b) What is organization behaviour ? Write importance of Organizational Culture and Organizational Power in an organization. **8**

OR

2. a) Explain the basic model of organizational structure. Comments on its span of control. **8**

   b) MIS creates a impact on the organizational function, performance and productivity. Justify with suitable example. **8**

3. a) Explain role and applications of MIS in insurance industry. **8**

   b) What are the major tasks performed by Personal Management System ? What are the various subsystems a Personal Management System uses to perform those tasks ? **8**

OR

4. a) What is service ? How Information Systems helps in Hotel services ? **8**

   b) What is production system ? Explain how Information Systems supports detail working of the operation, allocation and planning of production management. **8**

5. a) What is Business Process Outsourcing ? Write importance challenges in BPO management. **8**

   b) With suitable diagram explain Enterprise Management System. **10**

OR

6. a) What is Information Technology Architecture ? Explain with suitable examples. **8**

   b) Explain tangible and intangible benefits of using an ERP system for an organization. **10**

SECTION – II

7. a) Explain how do organization implement the change required using IT to transform organization and create new structure. **8**

   b) Explain various models used in e-commerce. Also explain various resources required for setting e-commerce firm. **8**

OR

8. a) How Web Management Service helps companies to manage their e-business infrastructure much more effectively ? **8**

   b) What is CRM ? Write the challenges and trends in Customer Relationship Management. **8**

9. a) What is decision ? Discuss the relevance and role of MIS in various phases in decision making. **8**

   b) What is data warehouse and how it is useful in managerial decision making ? **8**

OR

10. a) Explain Simon's model of decisions making. Also explain main features of DSS. **8**

    b) Explain major activities of Geographic Information System. Also explain how GIS is used for DSS. **8**

11. a) What is hacking ? How encryption is used as a tool for security management ? **6**

    b) Explain potential security problems in increasing use of intranets and extranets in business. **6**

    c) What is biometric security ? Explain the benefits of biometrics security over traditional security methods. **6**

OR

12. a) What is information system security ? Write the basic objectives of information system security. **6**

    b) Distinguish between computer crime versus computer abuse. Give examples to explain your answer. **6**

    c) What are major business drivers for global (IT) Information Technology ? **6**

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**[3863] – 158**

# T.E. (Information Technology) (Semester – II) Examination, 2010
## HUMAN COMPUTER INTERFACE
## (Course 2003)

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) Express your opinion-A design should be User-Centric. **8**

   b) Explain the difference between slips and mistakes with the help of suitable example. **8**

OR

2. a) We can't measure user friendliness. As a result this concept is not too useful when designing interfaces. Instead we identify specific things about the interface that we can measure that relate to the effectiveness and success of the product. There are at least five specific attributes that describe an interface's effectiveness. Explain three of these measurable quantities we can use to determine success. **8**

   b) Discuss the impact of inefficient screen design on processing time with an example. **8**

3. a) Explain OAI and keystroke level model. **10**

   b) Explain following user centered design principles with reference to an interface you know
   - Place the user in control
   - Reduce a user's memory load
   - Make the user interface consistent. **8**

OR

**P.T.O,**

4. a) Explain three types of users and how to accommodate their to make a more usable interface. **10**

   b) Explain guidelines for data entry and data display. **8**

5. a) What is participatory design ? Explain the advantages and disadvantages of participatory design. **8**

   b) Explain the processes of design. If your system interface is poorly designed, what are the problems user may face ? **8**

OR

6. Write short note on (**any two**) : **16**

   - Scenario and pattern
   - LUCID
   - Three pillars of interface design.

SECTION – II

7. a) Explain different interaction styles. **8**

   b) Distinguish between the tiled windows, overlapping windows and cascading windows and explain how a particular style can be picked. **8**

OR

8. a) List and explain the steps of usability testing. What are the limitations of such testing ? **8**

   b) Explain different Menu Styles. **8**

9. a) How do we think CSCW is likely to affect our lives in the future ? Justify your answer with examples. **8**

   b) Compare online and offline documentation. **8**

OR

10. a) What is face to face communication and asynchronous interactions in CSCW ? Explain any two applications of each. **8**

    b) List any four bad error messages encountered by you and suggest guidelines for presenting them in an effective way. **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) Explain the role of HCI in animation industry. **8**

OR

12. Write short notes on (**any two**) : **18**

    - Multimedia document searches
    - OAI model for web site design
    - Comparisons of pointing devices.

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**[3863] – 169**

# T.E. (Bio-Technology) (Semester – II) Examination, 2010
## CHEMICAL REACTION ENGINEERING – I
## (Common to Chemical)
## (2003 Course)

Duration : 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) The primary reaction occurring in homogenous decomposition of nitrious oxide is found to be $N_2O \rightarrow N_2 + \frac{1}{2}O_2$ with rate $-r_{N_2O} = k_1[N_2O]^2/(1 + k[N_2O])$. Devise mechanism to explain the observed rate. **8**

   b) Write short note on : **8**
   i) Temperature dependency of rate constant from Transition state theory.
   ii) Temperature dependency of rate constant from Arrhenius theory.

OR

2. a) Explain classification of chemical reactions with suitable examples. **8**

   b) i) Differentiate between elementary and nonelementary reactions. **8**
   ii) Differentiate between molecularity and order of reaction.

3. The kinetic data on reaction of sulphuric acid with diethyl sulphate in aqueous solution at 22 as follows. Find rate equation for this reaction if initial concentration of acid is 5.5 mol/lit. **16**

| **Time, Min** | 0 | 41 | 48 | 55 | 75 | 96 | 127 | 146 | 162 | 180 | 194 | 212 | 257 | 318 | 368 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Conc. of sulphate** | 0 | 1.18 | 1.38 | 1.63 | 2.24 | 2.75 | 3.31 | 3.76 | 3.8 | 4.11 | 4.31 | 4.45 | 4.86 | 5.1 | 5.3 |

OR

4. Sucrose is hydrolysed at room temperature by action of enzyme sucrase. Following kinetic data are obtained in batch reactor by starting run with sucrose concentration $C_{A0}$ = 1.0 mmol/lit. and enzyme conc. of 0.01 mmol/lit. Show by calculation whether these data fit kinetic equation. **16**

   $-r_A = k.C_A.C_E / (C_A + M)$. Determine k and M.

| **$C_A$** | 0.84 | 0.68 | 0.53 | 0.38 | 0.27 | 0.16 | 0.09 | 0.04 | 0.018 |
|---|---|---|---|---|---|---|---|---|---|
| **time, min** | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |

5. The liquid phase decomposition of A is studied in MFR. The results of steady state runs are as follows. Find the holding time required in PFR as well as MFR to obtain 75% conversion in feed with initial concentration of 0.8 mol/lit. **18**

| **Inlet Conc.** | **Exit Conc.** | **Holding time, sec** |
|---|---|---|
| 2.00 | 0.65 | 300 |
| 2.00 | 0.92 | 240 |
| 2.00 | 1.00 | 250 |
| 1.00 | 0.56 | 110 |
| 1.00 | 0.37 | 360 |
| 0.48 | 0.42 | 24 |
| 0.48 | 0.28 | 200 |
| 0.48 | 0.20 | 560 |

OR

6. Laboratory measurements of rate as function of conversion for an isothermal gaseous decomposition A = 3B are as follows. The data was collected at 150 C and 10 atm. with equimolar mixture of A and inerts.

   i) Calculate total volume of MFR in series to achieve 80% conversion with intermediate conversion of 50%

ii) Calculate total volume of PFR in series to achieve 80% conversion with intermediate conversion of 50%. Data is as follows **18**

| $X_A$ | $-r_A$, mol(lit.s) |
|---|---|
| 0 | 0.0053 |
| 0.10 | 0.0052 |
| 0.20 | 0.0050 |
| 0.30 | 0.0045 |
| 0.40 | 0.0040 |
| 0.50 | 0.0033 |
| 0.60 | 0.0025 |
| 0.70 | 0.0018 |
| 0.80 | 0.00125 |

SECTION – II

7. a) Consider parallel decomposition of A with R, S, T as products with $r_R = 1.0$; $r_s = 2C_A$, $r_T = C_A^2$. Determine maximum conversion of desired product T that can be obtained in PFR and MFR when initial concentration 5 mol/lit. **16**

   b) Define Yield and Selectivity. **2**

OR

8. Liquid A decomposes into R and S with rates $r_R = k_1 C_A^2$; $r_S = k_2 C_A$; $k_1 = 0.4\ m^3/(mol/min)$; $k_2 = 2\ min^{-1}$. An aqueous feed containing A ($C_{A0} = 40\ mol/m^3$) enters reactor and decompose. Find the operating conditions which maximizes $C_R$ in MFR. **18**

9. a) Write short note on Optimum Temperature Progression. **6**

   b) Determine equilibrium conversion for following elementary reaction A = R. **10**
   Data : $\Delta G^0 = -14130\ J/kmol$, $\Delta H_R^0 = -75000\ J/mol$; $C_{pA} = C_{pR}$ = constant.
   Construct plot of temperature Vs conversion and determine the optimum temperature.

OR

10. The reversible first order reaction A = R with rate $-r_A = k_1C_A - k_2C_R$ is carried out in PFR. Determine the optimum temperature in reactor if permissible feed temperature is 95°C and feed rate is 1000 mol/min. Conversion expected is 80% and $C_{A0}$ = 4 mol/lit. and $C_{R0}$ = 0. Calculate space time needed for 80% conversion if $F_{A0}$ = 1000 mol/min. with $C_{A0}$ = 4 mol/lit. **16**

Data : $k_1 = 34 * 10^6 \exp. (-48900/RT)$, $min^{-1}$

$k_2 = 1.57 * 10^{18} \exp. (-123800/RT)$, $min^{-1}$

E in J/mol

11. A sample of tracer was injected into a vessel and effluent concentration was measured as function of time. Construct C and E curve and determine the fraction of material leaving the vessel that has spent 3 and 6 min. and fraction of material that has spent 7.75 and 8.2 min. in the vessel. **16**

| t, min | C, gm/cc | t, min | C, gm/cc |
|---|---|---|---|
| 0 | 0 | 7 | 4 |
| 1 | 1 | 8 | 3 |
| 2 | 5 | 9 | 2.2 |
| 3 | 8 | 10 | 1.5 |
| 4 | 10 | 12 | 0.6 |
| 5 | 8 | 14 | 0. |
| 6 | 6 | 16 | 0 |

OR

12. The concentration readings are given below represent continuous response to a pulse input into closed vessel. The vessel is to be used as reactor for decomposition of liquid A. The reaction stoichiometry are given by $-r_A = k.C_A$, $k = 0.10\ mm^{-1}$. Calculate the conversion of reactant A in real reactor. **16**

| **t, min** | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 |
|---|---|---|---|---|---|---|---|---|---|
| $\mathbf{C_{pulse}}$ | 0 | 3 | 5 | 5 | 4 | 2 | 1.5 | 1 | 0 |

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**[3863] – 20**

# T.E. (Mechanical) (Semester – II) Examination, 2010
## METROLOGY AND QUALITY CONTROL
## (2003 Course)

Time : 3 Hours Max. Marks : 100

***N.B.*** *: 1)* ***All*** *questions are* ***compulsory****.*
*2) Figures to the* ***right*** *indicate* ***full*** *marks.*
*3) Assume suitable data* ***if necessary****.*
*4) Answer to the Sections –* ***I*** *and* ***II*** *should be written* ***separately****.*

SECTION – I

1. a) Compare the end standard and line standard. **6**

   b) Define straightness and flatness. Explain with neat sketch method of checking straightness of straight edge by wedge method. **10**

OR

   a) Describe with neat sketch the principle of working of an autocollimator and state its application. **8**

   b) Design a 'workshop' type GO and NOGO Gauge suitable for 25H7 the value of IT7 = 16i and the diameter step 18 and 30. **8**

2. a) Explain with pneumatic circuit diagram the solex pneumatic comparator. Explain advantages and limitations of pneumatic comparator. **8**

   b) Explain sigma mechanical comparator. **8**

OR

2. a) Explain the difference between primary texture and secondary texture. **4**

   b) Write short note on : **8**
      1) Constant deviation prism
      2) Angle dekor.

   c) A 1.45 mm slip gauge is being measured on a gauge length interferometer using a Cadmium lamp. The red and blue wavelength emitted by this lamp are 0.643850537 μm and 0.47999360 μm . Calculate the nominal fractions expected for the gauge for red and blue wavelength. **4**

**P.T.O.**

3. a) Derive the relation for width W and depth h by const. chord method. Calculate chord length and its distance below tooth tip for a gear of module 5 mm and pressure angle 20°. **8**

   b) Derive an expression for best wire size for measuring effective diameter. Calculate diameter of best size of wire for $M_{20} \times 2.5$ screw. Explain Rack correction and compression correction. **10**

OR

3. Write short notes (**any three**) : **18**

   1) Co-ordinate Measuring Machine

   2) Parkinson's Gear Roller Tester

   3) Tomlinson's Surfacemeter

   4) Types of pitch errors in screw thread.

SECTION – II

4. a) Differentiate between : **8**

      i) Vendor rating and Vendor quality rating.

      ii) Quality Control and Quality Assurance.

   b) Explain the concept of quality defined by Juran, Crosby, Deming and Taguchi. **8**

OR

   a) Explain Quality Policy. **5**

   b) The balance between cost of quality and value of quality gives optimum quality of design. Discuss. **6**

   c) Explain spiral progress in quality system. **5**

5. a) Differentiate between Chance Cause and Assignable Causes. **6**

   b) A manufacturer purchases small bolts in cartons that usually contain several thousands bolts. Each shipment consists of number of cartons, as a part of the acceptance procedure for these bolts, 400 bolts are selected at random form each carton and are subjected to visual inspection for certain defects. In a shipment of 10 cartons the respective percentages of defectives in the samples form each carton are 0, 0, 0, 5, 0.75, 0, 2, 0.25, 0.25 and 1.25. Does the shipment of bolts appear to exhibit statistical control ? **6**

   c) Distinguish between P-chart and C-chart. **4**

OR

5. a) Explain the following OC curve characteristic : **8**
   1) Changing of lot size
   2) Changing sample size
   3) Change of acceptance number
   4) Change of sample size.

   b) For the following data, calculate sample size and AOQ for single sampling plan :
   1) Probability of acceptance for 0.6% defective is 0.9397
   2) Lot size N = 10,000
   3) np = 2.5.

   Defectives found in sample are not to be replaced. **8**

6. Write short notes (**any three**) : **18**
   a) Quality Audit
   b) TS 16949
   c) Process Capability Index
   d) DMAIC.

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**[3863] – 3**

# T.E. (Civil) (Semester – I) Examination, 2010
## 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**.*
*6) **Use** of cell phone is prohibited in the examination hall.*
*7) Use of electronic pocket calculator IS : 800 and steel table is **allowed**.*

SECTION – I

1. a) What are the advantage and disadvantage of construction in structural steel ? **5**

   b) An I-section use as a bracket connected to flange of column as shown in fig. 1 b. Column is carrying a load of 120 kN at free end at a distance of 250 mm from the column flange. Design the welded connection. **12**

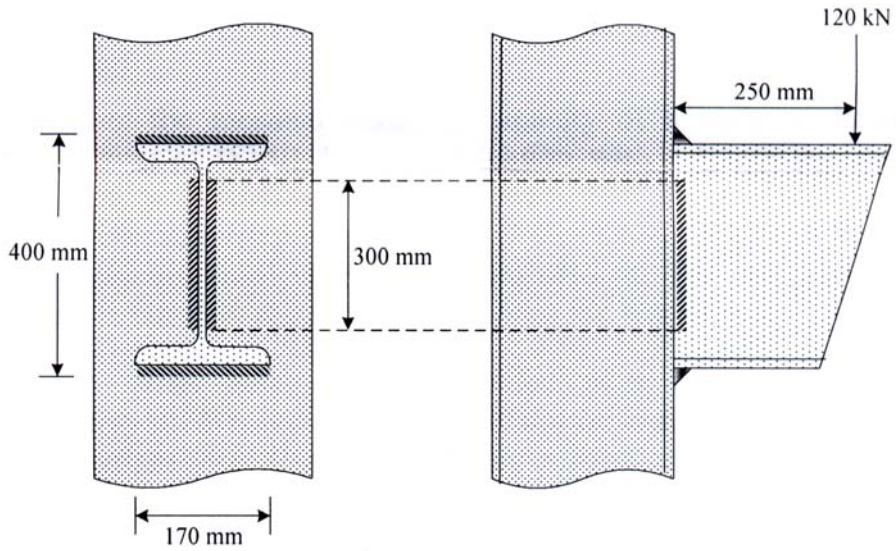


Fig. 1 b

**P.T.O,**

c) A tie member of a roof truss carries a load of 200 kN. Design a section using unequal angle with longer leg connected to gusset plate. Also design the bolted connection. **8**

OR

2. a) Differentiate between black bolt and HSFG bolts. Explain in details with sketches. **7**

b) An ISLB 300 @ 37.7 kg/m secondary beam transmits an end reaction of 125 kN to the web of ISHB 400 @ 77.4 kg/m main beam. Design bolted framed connection. Top flange of both the beams are at same level. Draw the neat sketch showing design details. **10**

c) A strut of a tower carries an axial load of 200 kN resulting due to wind load. The unsupported length of member is 3 m. Design a single angle section with welded connection and draw the sketch with design details. **8**

3. a) State and explain the design steps for the design of gantry girder. **9**

b) A simply supported beam of 5 m effective span carries uniformly distributed load of 30 kN/m on entire span along with a central point load of 50 kN. Compression flange of beam is laterally supported only at ends and centre of beam. The ends are restrained against torsion. Design a cross section of beam and apply usual checks. **16**

OR

4. a) Calculate the moment resisting capacity of a built up beam comprising of ISMB 450 @ 72.4 kg/m with a flange plate of 250 mm ×12 mm one each on both flange. Also calculate maximum superimposed uniformly distributed load the beam can carry on simply supported span of 6 m. The compression flange is laterally restrained throughout the length. **12**

b) Design cross section of a welded plate girder carrying uniformly distributed load of 120 kN/m on entire span of 18 m. The compression flange is laterally restrained throughout the length. Also design the end bearing stiffener. **13**

SECTION – II

5. a) A truss as shown in Fig. 5 a is used for an industrial building situated at Pune. The truss is covered with A C sheet. Calculate Panel point dead load, live load and wind load for the truss. Assume $k_1 = 1$, $k_2 = 0.9$, $k_3 = 1$, $c_{pe} = -0.7$ $c_{pi} = \pm 0.5$ and spacing of truss = 3 m. **15**

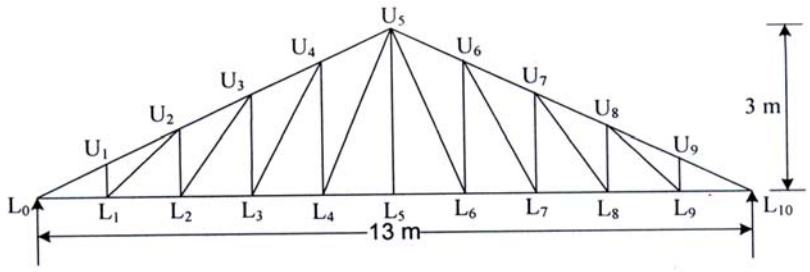


Fig. 5. a

b) A foot over bridge as shown in Fig. 5 b is subjected to live load of 5 kN/m$^2$ and dead load of 1.2 kN/m$^2$. The clear available width is 2.8 m and height of truss is 2 m. Design the cross beam for the bridge. **10**

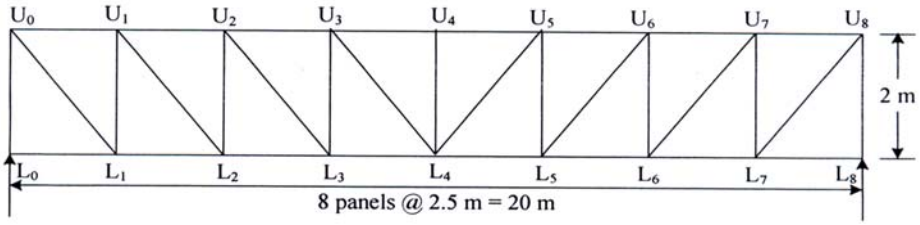


Fig. 5. b

OR

6. a) For the truss shown in Fig. 5 a, panel point dead load, live load and wind load are as follows. Design members $U_4U_5$, $L_4L_5$ and $U_5L_4$. **13**

| S. N. | Type of load | Intermediate panel point load in kN |
|---|---|---|
| 01 | Dead load | 03 |
| 02 | Live load | 02 |
| 03 | Wind load | 05 (suction) |

b) For the foot over bridge shown in Fig. 5 b, design the members $U_4U_5$, $L_4L_5$ and $U_5L_4$. RCC slab of 120 mm thick is provided as flooring. Clear width is 2.8 m and live load is 4 kN/m$^2$. **12**

7. a) A column consists of two channel sections placed face to face subjected to an axial force of 800 kN. The unsupported length is 10 m. Assuming column to fixed at both ends, design the section. Also design suitable lacing system and draw the design sketches. **20**

   b) Explain merits and demerits of cold formed light gauge section. **5**

OR

8. a) Design a column base for an axial load of 400 kN and bending moment of 75 kNm. A section ISHB 400 @ 77.4 kg/m is used as a column. The bearing stress in concrete is 4 $N/mm^2$. **15**

   b) Explain following term with respect to light gauge section. **10**

   i) stiffened element
   ii) unstiffened element
   iii) multiple stiffened element
   iv) flat width ratio
   v) effective design width.

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**[3863] – 36**

## T.E. Production (Semester – II) Examination, 2010
## MACHINE TOOLS AND ADVANCE MANUFACTURING SYSTEMS
## (2003 Course)

Time : 3 Hours Marks : 100

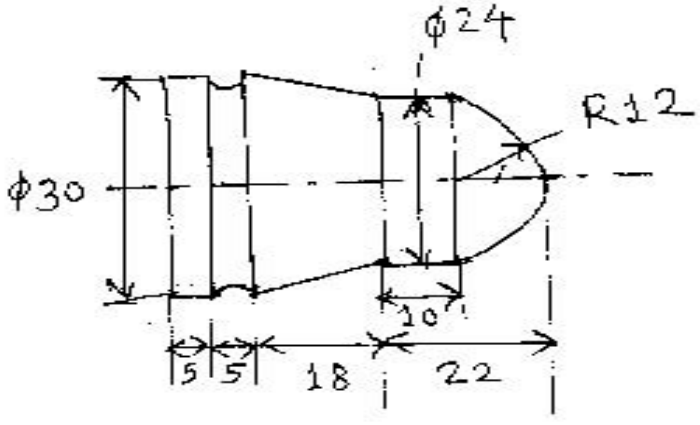
***Instructions :*** *1) Answers to the **two** Sections should be written in **separate** books.*
*2) **Neat** diagrams must be drawn **wherever** necessary.*
*3) Black figures to the **right** indicate **full** marks.*
*4) Use of electronic pocket calculator is **allowed**.*
*5) Assume suitable data,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

SECTION – I

1. The component shown in fig. No. – 1, is required in medium batch quantities and is to be machined on a turret automatic machine. Design and draw a set of plate cam for this purpose and also work out the following requirements : **18**
   i) Sequence of operation
   ii) Tooling layout
   iii) Table for cam angle, cycle time

   For turning, cutting speed – 30 m/min and feed – 0.20 mm/rev.

   For grooving, cutting speed – 15 m/min and feed – 0.10 mm/rev.




All dimensions are in mm

Fig. No – 1

OR

2. a) Discuss steps for cam design. **6**

   b) Compare single spindle automat with multi spindle automat. **6**

   c) Explain progressive action multi spindle automatic machine. **6**

3. a) State and explain co-ordinate systems used in NC/CNC machine. **8**

   b) Explain difference between NC, CNC and DNC machine. **8**

OR

4. a) Discuss machining centre and turning centre. **8**

   b) Explain different feed back devices used for position and velocity controls. **8**

5. a) Explain nano machining in detail. **8**

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

      i) Galvanising

      ii) CVD.

OR

6. a) Explain reason for using different surface coating on the material and list methods available for surface coating. **8**

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

      i) Micro-machining

      ii) Electro-plating.

SECTION – II

7. a) What are the methods used for balancing assembly lines ? Explain each in brief. **8**

   b) A eight station transfer machine has an ideal cycle time of 30 seconds. The frequency of line stops is 0.075 stops per cycle. When a line stop occurs, the average down time is 4.0 min. Determine :

      i) Average production rate parts/hr.

      ii) Line efficiency

      iii) Proportion downtime. **10**

OR

8. a) The precedence relationship and element times for assembling a new model of product is given in the table below. Ideal cycle time is 1.2 min.

| **Work element** | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| **Te (min)** | 0.5 | 0.3 | 0.8 | 0.2 | 0.1 | 0.6 | 0.4 | 0.5 | 0.3 | 0.6 |
| **Predecessor** | – | 1 | 1 | 2 | 2 | 3 | 4, 5 | 5, 6 | 7, 8 | 6, 9 |

      i) Construct precedence diagram.

      ii) Assign work element to station by RPW method.

      iii) Compute balance delay. **10**

   b) Differentiate flow lines without storage buffers with that of with storage buffers. **4**

   c) Classify the automated material handling equipments. **4**

9. a) Classify FMS based on different criterias. **8**

   b) Explain with neat diagram, Computer Integrated Manufacturing Systems (CIMS). **8**

OR

10. a) What are the advantages of simulation of manufacturing systems ? Which softwares are used ? **8**

    b) What are different Robot configurations ? Explain the terms used :
    1) Work volume
    2) System accuracy
    3) Degree of freedom
    4) Precision movement. **8**

11. a) Explain with neat sketch, any type of adaptive control used in C.N.C. machines. **8**

    b) Describe the factors which affect the performance and quality of C.N.C. machines. **8**

OR

12. a) Explain the maintenance policy, procedure and schedule adopted for C.N.C. machine maintenance. **8**

    b) Write a note on :
    i) Tool storage and changing system on C.N.C.
    ii) Tool wear monitoring system. **8**

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**[3863] – 38**

## T.E. (Production) (Semester – II) Examination, 2010
## METROLOGY AND QUALITY CONTROL
## (2003 Course)

Time : 3 Hours

SECTION – I

1. a) Define errors, explain following types of errors. **5**
   1) Random error
   2) Alignment error
   3) Contact error
   4) Parllax error

   b) Define wringing of slip gauges and manufacture of slip gauges. **5**

   c) Explain with neat sketch the clinometer. **6**

OR

2. a) Write a short note on :
   1) Auto collimator **5**
   2) Classification of standards **5**
   3) Calibration of dial indicator **6**

3. a) Determine the size of plug gauge for $60H_7F_8$ diameter 60 falls in between 50 to 80

   $i = 0.45 \sqrt[3]{D} + 0.001D$

   Fundamental deviation for shaft = $-5.5D^{0.41}$

   IT 7 = 16 i, IT 8 = 25 i. **10**

   b) What are the likely errors that can occur while manufacturing a precision gear ? Describe the effect of these errors on the performance of the gear. **6**

OR

4. a) Draw the set up and describe the procedure of checking squareness of cross slide of a lathe with reference to longitudinal guideways. **4**

   b) Differentiate between mechanical and pneumatic comparator. **6**

   c) Explain with neat sketch Johnson's Mikrokator. **6**

**P.T.O.**

5. a) What are the factors affecting surface roughness ? **3**

   b) Explain following methods of measuring surface roughness. **6**

      1) Profilometer

      2) Profilograph

   c) What is the phenomenon of interference of light rays ? What are the conditions under which this phenomenon takes place ? Draw the band structure obtained for following surfaces. **9**

      1) Concave surface

      2) Flat surface

      3) Convex surface

OR

6. a) Write a short note on : **18**

      1) Gear tooth vernier caliper

      2) Floating carriage micrometer

      3) The Pitter –NPL gauge interferometer.

SECTION – II

7. a) Explain Juran's contribution to quality control and sketch Juran trilogy diagram. **8**

   b) Explain Quality costs with their categories. **8**

OR

8. a) Describe TQM philosophy. **8**

   b) What is QFD ? Explain with neat sketch house of quality. **8**

9. a) Draw the OC curve and explain Producer's and Consumer's risk, AQL and AOQL. **8**

   b) The following table shows the number of defects found in 12 similar big castings.

| **Casting No.** | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **No. of defects** | 8 | 15 | 14 | 13 | 20 | 17 | 14 | 9 | 11 | 12 | 16 | 14 |

   Compute the control limits for the process and piot the control chart. Write the comments about the process. **8**

OR

10. a) Explain with neat sketch double sampling plan. **8**

    b) What is Malcom Balbridge National Quality Award ? Explain. **8**

11. a) What are the tools and techniques used in quality circle for problem solving ? **10**

    b) Explain in detail DMAIC. **8**

OR

12. Write short notes on (**any three**) : **18**

    a) Trends in control charts

    b) Zero defect

    c) ISO 14001

    d) Implementing ISO 9000 quality standard

    e) Design of experiments.

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**[3863] – 63**

# T.E. (Electrical) (Semester – I) Examination, 2010
# DESIGN OF ELECTRICAL MACHINES (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 modern trends in design of electrical machines. **6**

   b) Why the cooling is very sophisticated in large turbo-generators ? Explain hydrogen cooling method for alternator. **5**

   c) Classify the magnetic materials. To design magnetic circuit of electrical machines which type of materials is used. Why ? **5**

OR

2. a) Explain the insulating materials used in modern electrical machines. **5**

   b) Derive the expression for heating time constant. **6**

   c) A 500 MW direct water cooled turbo-generator has stator copper loss of 800 kw. The water inlet temp. is 38°C and the outlet temp. is 68°C.Calculate amount of water required per second. Also calculate the area of water duct in each subconductor if there are 48 slots with 2 conductors per slot and each conductor is subdivided into 32 subconductors. The velocity is not to be exceed 1.0 m/sec. The pumping pressure is 300 KN/$m^2$. Calculate the power of water pump if its efficiency is 0.6. **5**

**P.T.O,**

3. a) Explain the advantages of star connected three phase transformers. **4**

   b) Explain why power transformers are designed with high value of leakage reactance. **4**

   c) Determine the main dimensions of the core and window for a 1250 KVA, 33/6.6 kv, 50Hz, 3-phase, core type, power transformer based on the following information of design parameters. Max. flux density in the core $B_m$ = 1.5 T, current density = 2.5 A/mm$^2$, window space factor = 0.21, net area of three stepped core = 0.6 d$^2$ window proportions = 3 : 1, full load magnetic loading to mmf ratio = 1.687 $\times 10^{-6}$. **8**

OR

4. a) Explain the roll of the following in power transformer operations.
   i) Breather
   ii) Conservator
   iii) Explosion vent
   iv) Temperature indicator
   v) Buchholz relay. **8**

   b) Estimates the main core dimensions, the number of turns, in the two winding and the conductor sections in a 25 KVA, 3-phase, 6600/440V, delta/star, 50 Hz, core type transformer with following data. Stepped core for which area factor is 0.56, space factor for window = 0.25, volts per turn = 2.1 V, current density = 2.36 A/mm$^2$, maximum flux density = 1.1 T. **8**

5. a) Derive the formula for the axial forces developed in the transformers. **8**

   b) Calculate the active and reactive components of no load currents of a single phase, 50 Hz, 6600/400V, core type transformer with the following particulars.

   Mean length of flux path = 250 cm,

   Cross sectional area of core = 140 sq.cm.

   Max.flux density = 1.2 T

   Specific core loss at 1.2 T = 2.3 W/kg

   Ampere turns per cm for transformer steel at 1.2 T = 6.5.

   The effect of joints is equivalent to that of an air gap of 1 mm in the magnetic circuit. **10**

OR

6. a) Explain the factors on which the temperature rise of the transformer depends. **6**

   b) What is thermal rating of the transformer ? **6**

   c) Enlist the routine tests carried out on a transformer and in short explain the significance. **6**

SECTION – II

7. a) Derive the relation relating rating of a 3-phase induction motor with its main dimensions. Clearly state the units and meaning of each symbol used. **8**

   b) Find the main dimensions and the number of turns per phase for a 415 V, 50Hz, 11kw, 1440rpm, 3-phase cage induction motor using following data :

   Sp. magnetic loading = 0.46 wb/$m^2$

   Sp.electric loading = 30000 A/m

   Full load efficiency = 87%

   Full load power factor = 0.88

   Stator slots/pole/phase = 3

   Full pitch winding with 60° phase spread.

   Find cross-sectional area of stator conductor choosing current density of 4.8 A/$mm^2$.

   State any other assumptions used. **8**

OR

8. a) Explain the factors which are to be considered while selecting the number of stator slots of an induction motor. **8**

   b) For good overall design find the main dimensions and the number of the turns per phase of a 3-phase, 50 Hz, 415V, 37 kw, 6-pole, delta connected sq.cage induction motor. Assume,

   full load efficiency = 0.89

   full load power factor = 0.89

   $B_{av}$ = 0.45 T

   ac = 31000 A/m

   State whether ventilating ducts will be used. **8**

9. a) List the factors which are to be considered when estimating the length of air gap in an induction motor. Explain the effect of length of air gap on the overloading capacity of I.M. **8**

   b) Explain why the choice of number of rotor slots in three phase induction motor is critical. **8**

OR

10. a) Explain the phenomena of crawling and cogging as applicable to S.C.I.M. What steps are taken while designing, to avoid their occurrence ? **8**

    b) Sketch and explain the distribution of rotor bar and end ring currents under one pole pair. Determine the relation between bar and end ring currents. State assumptions used. **8**

11. a) What is dispersion co-efficient ? Discuss its effects on power factor and over load capacity of an induction motor. **8**

    b) Explain the difference between diecast rotor and fabricated rotor. **5**

    c) Explain the methods of improving starting torque of three phase induction motor. **5**

OR

12. a) Explain why the flux density at 60° from the neutral axis is considered while estimating the magnetizing current of a 3-phase induction motor. **8**

    b) Explain how the temperature rise of stator of a 3-phase induction motor is estimated. **6**

    c) Why magnetizing current of a 3-phase induction motor is much more in magnitude than that of a 3-phase transformer of the same power rating ? **4**

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# T.E. (Electrical) (Semester – I) Examination, 2010
## CONTROL SYSTEM – I (2003 Course)

Time : 4 Hours | Total Marks : 100

SECTION – I

1. a) Discuss the advantages and disadvantages of closed loop control system over the open loop control system. **4**

   b) Explain, giving examples : **6**

      i) Transfer function

      ii) Pole-zero plot

      iii) Order and type of system.

   c) Find the transfer function for the network shown in fig. 1c; Given L = 1h, R = 2 Ω and $R_L$ = 4 Ω show the location of poles and zeros. **8**

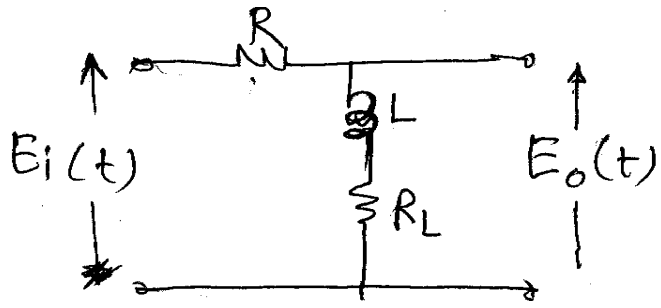


Fig. 1c

OR

2. a) For the system shown in fig. 2a, draw the signal flow graph and deduce $\frac{C(s)}{R(s)}$. **8**

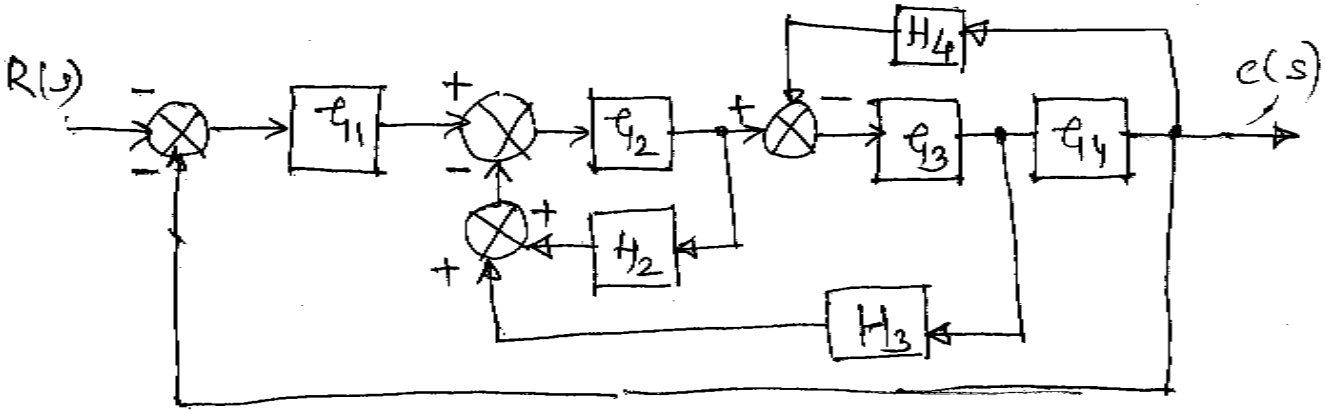


Fig. 2a

b) Obtain differential equation of mechanical system shown in fig. 2b. Draw the electrical analogous circuit based on force-current analogy. **10**

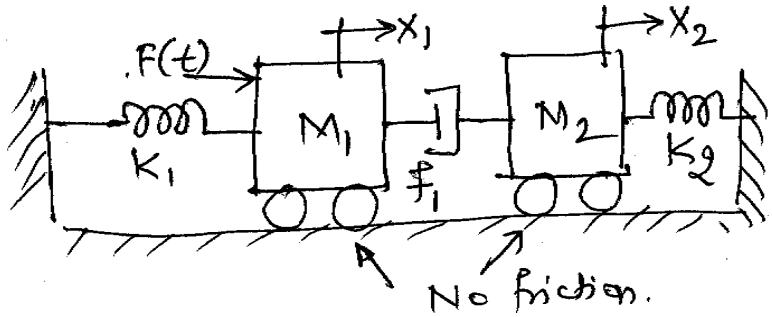


Fig. 2b

3. a) Explain static error constants and steady state errors for type '1' system. **8**

b) The overall transfer function of a unity feedback system is given by $\frac{C(s)}{R(s)} = \frac{10}{s^2 + 6s + 10}$. Find the values of static error constants. Also, determine the steady state error for the input $r(t) = 1 + t + t^2$. **8**

OR

4. a) Sketch the time response plot for a under damped system and explain all the time response specifications. **8**

   b) Explain the effect of PI, PD and PID controllers on the time response. Write also the equations for each controller, giving relationship between input and output. **8**

5. a) Giving examples, explain the following terms : **4**
      i) Absolute stable system
      ii) Marginal stable system
      iii) Unstable system.

   b) State and explain Routh's criterion for investigating stability. Discuss also special cases with examples. **6**

   c) Discuss stability of a control system having characteristic equation as : **6**

   $s^5 + 4s^4 + 8s^3 + 8s^2 + 7s + 4 = 0.$

   OR

6. a) State and describe angle and magnitude conditions. **4**

   b) Sketch the root locus for a system having :

   $$G(s) = \frac{k}{s+1} \text{ and } H(s) = \frac{(s+1)}{(s^2 + 4s + 5)}$$

   Discuss stability of the system. **12**

SECTION – II

7. a) Write the definitions of frequency domain specifications. Also discuss co-relation between time and frequency domain specifications for a second order system. **8**

   b) Find the frequency domain specifications with a unity feedback system having

   $$G(s) = \frac{36}{s(s+8)}.$$ **8**

   OR

8. a) Explain with necessary figures, how to calculate :
   i) Gain margin
   ii) Phase margin
   iii) Gain cross-over frequency
   iv) Phase cross over frequency from the bode plot. **6**

   b) A unity feedback control system has $G(s) = \frac{k}{s(s+4)(s+10)}$. Draw the bode plot, discuss stability and also find k when PM = 30°. **10**

9. a) Explain the concept of polar plot used in frequency domain analysis. **4**

   b) Make the sketches of polar plot for :
   i) Type '1' and order '1' system
   ii) Type '1' and order '2' system
   iii) Type '2' and order '3' system. **12**

OR

10. a) State and explain Nyquist stability criterion. **6**

    b) For $G(s)H(s) = \frac{12}{s(s+1)(s+2)}$, draw the Nyquist plot and decide stability. Calculate gain margin. **10**

11. a) Discuss characteristics, network selection and transfer function of :
    i) Lead compensator
    ii) Lag compensator. **12**

    b) Give the design procedure for Lag compensation using bode plot. **6**

OR

12. a) Explain design procedure for finding transfer function of Lead compensator network using Root locus sketch. **6**

    b) Design a lead compensator for a type 2 system with an open loop transfer function $G(s) = \frac{k}{s^2(0.2s+1)}$. Assume that the system is required to be compensated to meet the following specifications
    i) Acceleration error constant $K_a = 10$
    ii) Phase margin = 35°. **12**

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# T.E. (Instrumentation and Control) (Semester – II) Examination, 2010
## PROCESS LOOP COMPONENTS
## (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** indicates **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 typical temperature control loop using P and ID symbols. **8**
   b) Develop signal conditioning circuit for k type thermocouple for a range of 30°C to 300°C to get 0 to 5V output. MV output of k type thermocouple for 30°C and 300°C is 1.25 MV and 12.21 MV respectively. **10**

OR

2. a) Draw P and ID symbols for the following i) Control valve ii)Orifice iii) Level alarm high iv) pressure switch. **8**
   b) Develop signal conditioning circuit for RTD (Pt-100) for a temperature range of 0 to 100°C to get output of 0 – 5V. **10**

3. a) Explain the role of converters in process industries. Describe any one type. **8**
   b) With respect to DPT explain the following
      i) Manifold ii) Zero elevation. **8**

OR

4. a) State advantages of 2 wire transmitters over 4 wire transmitters. **6**
   b) Explain with suitable examples various process lags. **10**

**P.T.O,**

5. a) Explain and give application of Time Proportional Controller. **8**

   b) Define tuning of controller. Explain different criterias for tuning of controller. **8**

OR

6. a) Explain the following wrt controller
      i) Proportional band
      ii) Neutral zone
      iii) Position algorithm
      iv) Integral time. **8**

   b) Suggest and justify the type of controller for temperature and pressure control loops. **8**

SECTION – II

7. a) Explain the following with respect to PLC (Programmable Logic Controller)
      i) Rack and slot
      ii) Scan time
      iii) Programming device
      iv) OFF delay timer **8**

   b) In a furnace control application, the fuel valve should open only after fuel and air pressures are high. Develop relay ladder diagram for the same. **8**

OR

8. a) Comment on 'Interfacing of pneumatic systems with PLC'. **8**

   b) Develop ladder diagram for oven control with following interlock.

   The heater will turn ON when ON switch is activated, the door is closed and temperature is below limit. A red light should glow when the door is open. **8**

9. a) List various control valve accessories. Explain any two accessories in brief. **10**

   b) Compare the following :
      i) Inherent and installed characteristics
      ii) Pneumatic and electric actuators. **8**

OR

10. a) Explain with neat sketch working of rotary valve. **8**

    b) Explain the following with respect to control valve.

    i) Valve coefficient

    ii) Rangeability

    iii) Valve trim

    iv) Bonnet

    v) Leakage. **10**

11. a) Compare Intrinsic Safety and Purging protection method based on the following points.

    i) Safety

    ii) Cost of installation

    iii) Maintenance

    iv) Reliability **8**

    b) With the help of neat block diagram explain the working of square root extractor. **8**

OR

12. a) Explain the need of the following components

    i) High/Low selector

    ii) Flow totalizer **8**

    b) Explain volumetric type of Feeders. **8**

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**[3863] – 1**

# T.E. (Civil) (Semester – I) Examination, 2010
# THEORY OF STRUCTURE – II
# (2003 Course)

Time : 3 Hours Max. Marks : 100

***Instructions*** *:1) Solve Que.* ***1*** *or Que.* ***2****, Que.* ***3*** *or Que.* ***4****, Que.* ***5*** *or Que.* ***6*** *from Section* ***I****. Que.* ***7*** *or Que.* ***8****, Que.* ***9*** *or Que.* ***10****, Que.* ***11*** *or Que.* ***12*** *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) Your answers will be valued as a* ***whole****.*

*5) Assume suitable data* ***wherever*** *necessary and mention it in the* ***answer sheet****.*

*6)* ***EI*** *is constant if* ***not*** *mentioned in example.*

*7)* ***Use*** *of electronic pocket calculator is* ***allowed****.*

SECTION – I

1. A fixed beam AB of span 9 m is subjected to udl of 25 kN/m over entire span. An intermediate point C divides the beam AB such that span AC is 6 m and CB is 3 m. Moment of Inertia (MI) for span AC is twice of MI for span CB. Use slope Deflection method. Draw BMD and SFD. **18**

OR

2. Analyse the rigid jointed plane frame, loaded and supported as shown in fig. 1, using moment distribution method. Draw BMD and SFD. **18**

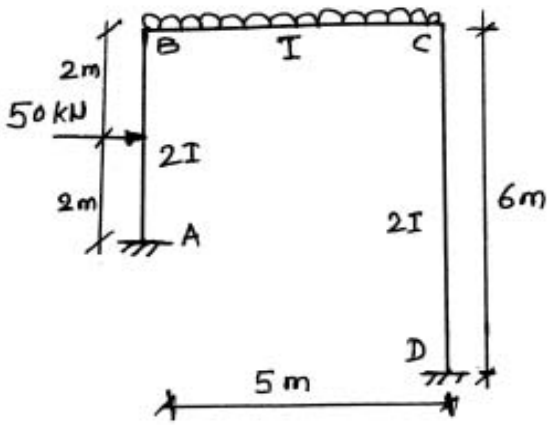


Fig -1

3. Analyse the beam, loaded and supported as shown in fig. 2, using Flexibility Matrix Method. Draw BMD and SFD. **16**

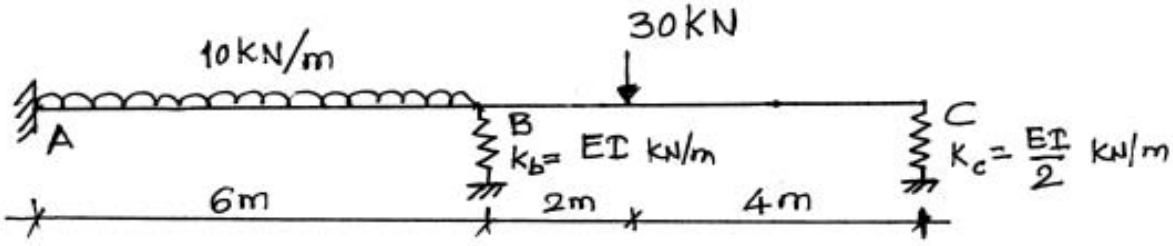


Fig-2

OR

4. Analyse the rigid jointed plane frame loaded and supported as shown in fig. 3, using stiffness matrix method. Draw BMD and SFD. **16**

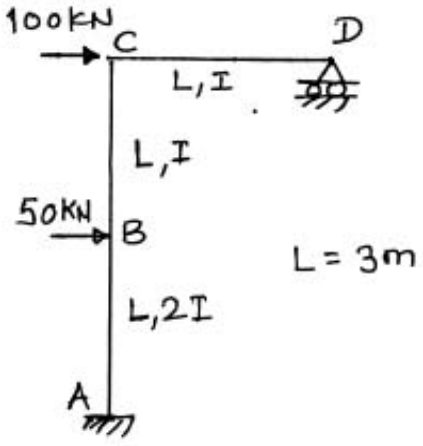


Fig - 3

5. State the assumptions made in Cantilever method of Approximate analysis. Hence analyses the rigid jointed 2-bay 2-story plane frame with fixed supports at ground, with following data.
   Width of each bay = 5 m, width of each story height = 4 m,
   Lateral point loads of magnitude 50 kN each acts from Left to right at $1^{st}$ and $2^{nd}$ story level on Left side external column in the plane of frame. Draw BMD, SFD and Axial Force Diagram for ground story members of frame. Also find the support moment and support reaction. Assume constant EI and constant area for each member. **16**

OR

6. A uniform quarter circular beam, ABC of radius R, curved in plan, is simply supported at ends, A & C and at mid point, B along the arc. The beam is loaded with uniformly distributed load; 'w' per meter over the length AC. Plot the SFD and BMD along the spans, AB and BC. **16**

SECTION – II

7. a) Locate the principal planes and evaluate the principal strains at a point (2, 3) for the following system of strain. **9**

   $\in_x = 4x^2 + 3y^2 + 2x^3 + y^3 + 10$

   $\in_y = 2x^2 + 6y^2 + x^3 + 3y^3$

   $\gamma_{xy} = x^2 + y^2 + x^4 + y^4$

   Where strains are expressed in micro mm and co-ordinates of the points are in mm.

   b) Derive the Elastic stability stiffness matrix for Beam-Column element. **9**

OR

8. a) The strain at the point is given by **9**

$$[\in] = \begin{bmatrix} 18 & 00 & -36 \\ 00 & -54 & 5.4 \\ -36 & 5.4 & 00 \end{bmatrix}.$$

   Determine the stress matrix if E = 210 Gpa and $\upsilon$ = 0.3.

   b) Derive the equation for the Beam-Column with one end fixed and other end simply supported. **9**

9. a) Determine the shape factor for solid circle of diameter, 4 m. **8**

   b) A cable is simply supported at the two ends and carries a udl, w per meter run on the horizontal span, *l*. For the cable, if L is the length, (x, y) are the Co-ordinates of the any point on the cable, h is the dip, then derive the expressions for maximum tension in the cable, equation of the cable, and length of the cable. **8**

OR

10. a) Explain the stress distribution from elastic to plastic stage for hot rolled I section. Hence draw the illustrative stress distribution diagram in elastic, elasto-plastic and plastic stage. **8**

   b) A cable of the suspension bridge of span 75 m is hung from the piers 12 m and 7.5 m respectively above the lowest point of the cable. The load carried by the
   cable is 50 kN/m. Find the following : **8**

   i) Length of the cable between the piers

   ii) Horizontal pull in the cable and

   iii) Tension in the cable at the piers.

11. a) What do you understand by **Finite Element Method ?** How this method is used for the analysis of the structure ? **8**

   b) Calculate the displacement at centre of simple supported beam; AB of span 6 m subjected to two point load of 50 kN at 2 and 4 m from support either support. Assume interval increment at 1 m, EI is constant. Use **finite difference method**. **8**

OR

12. a) What do you understand by **Finite difference method** ? How this method is used for the analysis of the structure ? **8**

   b) Derive the stiffness matrix for a beam element considering axial deformation. (i.e. consider 3 degree of freedom at each end). **Use finite element method.** **8**

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**[3863] – 100**

# T.E. (Printing) (Semester – II) Examination, 2010
# THEORY OF PRINTING MACHINES AND MACHINE DESIGN
# (2003 Course)

Time : 4 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 – I

1. a) Two mating involute spur gears of 20° pressure angle have a gear ratio of 2. The number of teeth on the pinion is 20 and its speed is 250 rpm. The module pitch of the teeth is 12 mm. If the addendum of each wheel is such that the path of approach and the path of recess on each side are half the maximum possible length each, find

   i) the addendum for pinion and gear wheel;

   ii) the length of arc of contact

   Assume pinion to be driver. **10**

   b) Explain interference and undercutting in involute gear. **6**

OR

2. a) Define the terms related to helical gears "

   i) helix angle

   ii) circular pitch

   iii) normal circular pitch. **6**

b) 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 rpm find;

i) Number of teeth on pinion to avoid interference on it and the corresponding number on the wheel

ii) The length of path of contact

iii) The length of arc of contact

iv) The number of pairs of teeth in contact. **10**

3. a) What is the difference between a simple gear train and compound gear train ? Explain with the help of sketches. **6**

b) In a reverted epicyclic gear train, the arm 'A' carries two gears 'B' and 'C' and compound gear 'D' - 'E'. The gear 'B' meshes with gear 'E' and the gear 'C' meshes with gear 'D'. The number of teeth of gears 'B', 'C' and 'D' are 75, 30 and 90 respectively. Find the speed and direction of gear 'C' when gear 'B' is fixed and the arm 'A' makes 100 rpm clockwise. **10**

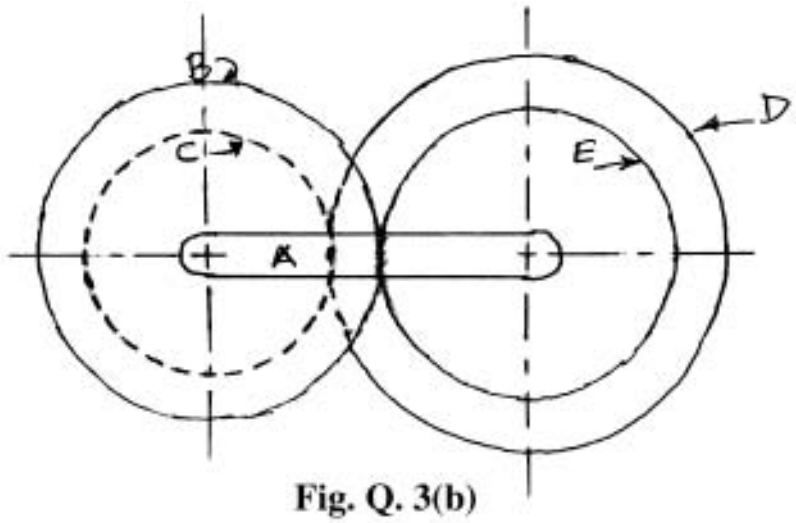


**Fig. Q. 3(b)**

OR

4. a) Figure shows an epicyclic gear train. Pinion 'A' has 15 teeth and is rigidly fixed to the motor shaft. The wheel 'B' has 20 teeth and gears with 'A' and also with the annular fixed wheel 'D'. Pinion 'C' has 15 teeth and is integral with B. (B, C being a compound gear wheel). Gear 'C' meshes with annular wheel 'E', which is keyed to the machine shaft. The arm rotates about the same shaft on which 'A' is fixed and carries the compound wheel 'B', 'C'. If the motor runs at 1000 rpm, find the speed of the machine shaft. Find the torque exerted on the machine shaft if the motor develops a torque of 100 N-M. **16**

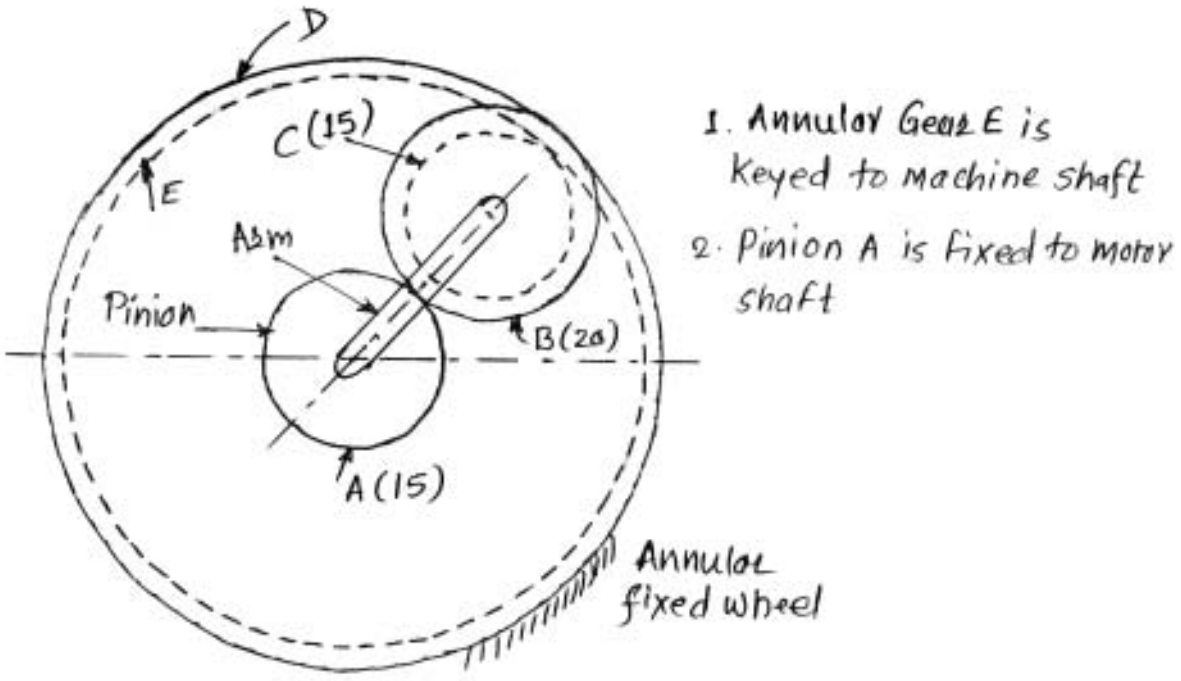


**Fig. Q. 4(a)**

5. a) Explain the types of followers according to
   i) Shape of the follower
   ii) Movement of the follower
   iii) Location of line of moment. **6**

b) Draw the profile of a cam operating a knife edge follower having a lift of 30 mm. The cam raises the follower with SHM for 150° of the rotation, followed by a period of dwell for 60°. The follower descends for the next 100° rotation of the cam with uniform velocity, again followed by a dwell period. The cam rotates at a uniform velocity of 120 rpm and has a least radius of 20 mm. What will be the maximum velocity and acceleration of the follower during the lift and the return stroke ? **12**

OR

6. Draw the profile of a cam operating a roller reciprocating follower and with the following data :
Minimum radius of cam = 25 mm,
Lift = 30 mm, Roller diameter = 15 mm.
The cam lifts the follower for 120° with SHM followed by a dwell period of 30°. Then the follower lowers down during 150° of the cam rotation with uniform acceleration and deceleration followed by a dwell period. If the cam rotates at a uniform speed of 150 rpm, calculate the maximum velocity and acceleration of the follower during the descent period. **18**

SECTION – II

7. a) Explain the terms with neat sketches : **8**

i) Soderberg diagram
ii) Goodman diagram
iii) Modified Goodman diagram.

b) Explain the effect of following modifying factors on endurance strength :

i) Surface finish factor
ii) Size factor
iii) Reliability factor
iv) Modifying factor to account stress concentration. **8**

OR

8. a) A transmission shaft of cold drawn steel 27 Mn2 ($S_{ut}$ = 500 N/mm$^2$ and $S_{yt}$ = 300 N/mm$^2$) is subjected to a fluctuating torque which varies from –100 N-mm to + 400 N-mm. The factor of safety is 2 and the expected reliability is 90%. Neglecting the effect of stress concentration, determine the diameter of the shaft.

   Take $K_a$ = 0.8, $K_b$ = 0.85, $K_c$ = 0.897

   Assume the distortion energy theory of failure. **8**

   b) What is stress concentration ? Explain with neat sketches, different ways to reduce stress concentration. **8**

9. a) A spur pinion having 21 teeth is to be made of plain carbon steel 55C8 ($S_{ut}$ = 720 N/mm$^2$) is to mesh with a gear to be made of plain carbon steel 40C8 ($S_{ut}$ = 580 N/mm$^2$). The gear pair is to transmit 25 KW power from an IC engine running at 1440 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 face width is 10 times the module and the tooth system is 20° full depth involute. The gears are to be machined to meet the specification of grade 6. The gear and pinion are to be case hardened to 400 BHN and 450 BHN respectively. The deformation factor 'C' for gear pair is 11500 e N/mm.

   Design the gear pair by using dynamic factor $K_V = \dfrac{6}{(6+V)}$ and Bucking Ham's equation for dynamic load. Use following relations

$$Y = 0.484 - \frac{2.87}{Z}$$

$$\text{Dynamic load } (F_d) = \frac{21V(bc + f_{t\,max})}{21V + \sqrt{bc} + f_{t\,max}}, N$$

$$K = 0.16\left(\frac{BHN}{100}\right)^2, \; f_{t\,max} = K_a.K_m.F_t, N$$

$$Q = \frac{2Z_g}{Z_p + Z_g}, \text{ for grade } 6 : e = 8.0 + 0.63\left(m + 0.25\sqrt{d}\right), \mu m ,$$

First choice of std. modules in mm recommended by ISO :

1, 1.25, 1.5, 2, 2.5, 3, 4, 5, 6, 8, 10, 12, 16, 20, 25, 32, 40. **18**

OR

10. a) Explain causes and remedies for the following gear tooth failures,

i) Bending failure

ii) Destructive pitting failure

iii) Abrasive wear. **8**

b) The following data is given for a steel gear pair transmitting 5 KW power from shaft rotating at 1500 rpm

i) Module = 4 mm

ii) Service factor ($K_a$) and load distribution factor ($K_m$) = 1

iii) Number of teeth on pinion = 18

iv) Allowable bending stress for pinion and gear = 210 N/mm$^2$

v) Face width = 40 mm

vi) Surface Hardness = 400 BHN

vii) Tooth system = 20° full depth involute

viii) Combined teeth error (e) = 15 microns

ix) Deformation factor C = 11400C, N/mm

x) Buckingham's equation for dynamic load,

$$F_d = \frac{21V\ (bc + F_{t\,max})}{21V + \sqrt{bc} + F_{t\,max}}, \text{ N}$$

xi) $Y = 0.484 - \frac{2.87}{Z}$

$$K = 0.16 \left( \frac{BHN}{100} \right)^2, \; F_{t\,max} = K_a . K_m . F_t, \; N$$

Assuming the dynamic load is accounted by Buckingham's equation calculate,

i) The factor of safety against bending failure

ii) The factor of safety against pitting failure. **10**

11. a) Compare ball and roller contact bearings. **8**

b) Write short notes on :

i) Mounting methods of bearing

ii) Bearing selection from manufacturing catalogue. **8**

OR

12. a) A deep-groove ball bearing having bore diameter of 60 mm and rotating at 1440 rpm is subjected to a radial force of 2500 N and an axial force of 1200 N. The radial and thrust factors are 0.56 and 2.0 respectively. The load factor is 1.2. If the expected rating life is 25000 hours, calculate the required basic dynamic capacity of the bearing. **7**

b) Explain the following : **9**

i) Basic static capacity of bearing

ii) Basic dynamic capacity of bearing

iii) Bearing life.

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**[3863] – 101**

# T.E. (Chemical) (Sem. – I) Examination, 2010
# CHEMICAL ENGINEERING MATHEMATICS
# (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) Your answers will be valued as a **whole**.*
*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 steel ball of volume 1000 CC, $\rho = 1.25\,g/CC$ and $C_P$=0.8 cal/g/°C is at a uniform temperature of 100°C. This is dropped into an insulated vessel containing 5000 CC of water at 20°C. Determine eigen values and eigen vectors of the given system. Neglect spatial gradients in both the ball and the fluid. The heat transfer rate UA between the ball and the fluid is 1000 cal/S/°C. Using the subscript 'b' for ball and 'w' for water, the energy balance equation for each is,

$$V_b \rho_b C_{pb} \frac{dT_b}{dt} = -VA\,(T_b - T_w)$$

$$V_w \rho_w C_{pw} \frac{dTw}{dt} = +VA\,(T_b - T_w)$$

Solve the given system using eigen values and eigen vectors. **18**

OR

2. a) Apply Gauss Seidal method to solve

$83x_1 + 11x_2 - 4x_3 = 95$

$7x_1 + 52x_2 + 13x_3 = 104$

$3x_1 + 8x_2 + 29x_3 = 71.$ **9**

b) Find out the '$A^{-1}$' of given matrix A where

$$A = \begin{bmatrix} 3 & 5 \\ -2 & -4 \end{bmatrix}$$ using Sylvester formulae. **9**

**P.T.O.**

3. a) The liquid and vapour mole fractions of different components in a distillation column are related by the expression, $y_i = k_i x_i$. Find the bubble temperature of a three components equilibrium mixture if the following data is provided. Use Newton - Raphson method. **10**

**Liquid phase mole fraction**

| $x_i$ | $k_i$ |
|---|---|
| 0.333 | $200/T^2$ |
| 0.333 | $300/T^2$ |
| 0.333 | $400/T^2$ |

b) Derive the formula for Euler's Method. **6**

OR

4. a) The temperature of the slab at one end is 1000°C. The ambient temp. is 45°C. Heat flow from one end to other end of the slab is 20.4 KW, for area of $1m^2$. The thermal conductivity of a slab is given by K = 0.8 (1 + 0.002T) where T is the temp. at the other end. The thickness of slab is 40 cm. Find the temp. at the other end. Use $2^{nd}$ order Runge-Kutta method. Take h = 10 cm. **8**

b) Pure ethylene is heated from 30 to 250°C at a constant pressure. Calculate the heat added per kg mole of ethylene, using the following equation.

$$C_P = 2.83 + 28.601 \times 10^{-3} T - 87.26 \times 10^{-7} T^2$$

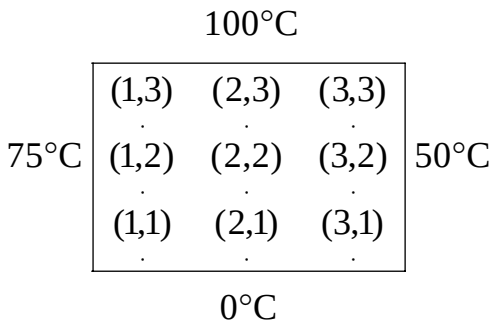
Use Simpson's $\frac{1}{3}^{rd}$ Rule. **8**

5. Use the simple implicit finite difference approximation to solve for the temperature distribution of a long, thin rod with a length of 10 cm and the following values : $k' = 0.49\ cal/(s.cm.°C)$, $\Delta x = 2\ cm$, and $\Delta t = 0.1\ sec$. At t = 0, the temperature of the rod is zero and the boundary conditions are fixed for all times at $T_{(0)}$ = 100°C and $T_{(10)}$ = 50°C. Note that the rod is aluminum with

$C = 0.2174 \frac{cal}{g.°C}$ and $\rho = 2.7\ g/cm^3$. Also $k = \frac{k'}{\rho C}$ and $\lambda = \frac{k \cdot \Delta t}{(\Delta x)^2}$. **16**

OR

6. Use Liebmann's method to solve for the temperature of the heated plate in fig. Employ over relaxation with a value of 1.5 for the weighting factor and do the two iterations. **16**




## SECTION – II

7. Table presents data of vapour pressure Vs temp. for benzene. Some design calculations require these data to be correlated by algebraic equation which provide P in mm Hg as a function of T in °C. A simple polynomial is often used as an empirical modeling equation. This eq$^n$ can be written as $P = a_0 + a_1T + a_2T^2$ Regress the data with this polynomial and find out coefficient's values. **16**

| **Temp. T ($^oC$)** | –36.7 | –19.6 | –11.5 | –2.6 | 7.6 | 15.4 | 26.1 | 42.2 | 60.6 | 80.1 |
|---|---|---|---|---|---|---|---|---|---|---|
| **Pressure P (mm Hg)** | 1 | 5 | 10 | 20 | 40 | 60 | 100 | 200 | 400 | 760 |

OR

8. Explain the following terms : **16**
   1) Arithmetic mean
   2) Standard deviation
   3) Variance
   4) Degree of freedom
   5) Coefficient of variation
   6) Coefficient of determination.

9. 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. **8**

b) Show that $\frac{\partial x^p}{\partial x^q} = \delta_q^p$. **8**

OR

10. a) Write the law of transformation for the tensors : **8**

1) $A_{jk}^{i}$ 2) $B_{ijk}^{mn}$ c) $C^m$

b) Write the different fundamental operations with tensors. **8**

11. a) A manufacturer produces two types of models $M_1$ and $M_2$. Each $M_1$ model requires 4 Hrs of grinding and 2 Hrs of polishing; whereas each $M_2$ model requires 2 Hrs of grinding and 5 Hrs of polishing. The manufacturer has 2 grinders and 3 polishers. Each grinder works for 40 Hrs a week and each polisher works for 60 Hrs a week. Profiton $M_1$ model is Rs. 3 and on an $M_2$ model is Rs. 4. Whatever is produced in a week is sold in the market. Formulate the problem to make the maximum profit in a week. **8**

b) Explain the nature of optimization problem. **6**

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

1) Basic feasible solution 2) Key column
3) Key element 4) Outgoing variables.

OR

12. A firm produces three products which are processed on three machines. The relevent data is given below : **18**

| Machine | Time per Unit (minutes) | | | Machine capacity (minutes/day) |
|---|---|---|---|---|
| | Product A | Product B | Product C | |
| $M_1$ | 2 | 3 | 2 | 440 |
| $M_2$ | 4 | - | 3 | 470 |
| $M_3$ | 2 | 5 | - | 430 |

The profit per unit for products A, B and C is Rs. 4, Rs. 3 and Rs. 6 respectively. Determine the daily number of units to be manufactured for each product. Assume that all the units produced are consumed in the market. Use simplex method.

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# [3863] – 102

## T.E. (Chemical Biotechnology)(Semester – I) Examination, 2010
## MASS TRANSFER – I
## (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) A narrow tube partially filled with liquid and maintained at constant temperature. The liquid evaporates slowly due to gentle stream of gas, which is passed across open end of the tube. Liquid evaporates and liquid level drops slowly. At time 't' the level is 'Z' from the top. Deduce an expression to estimate the value of diffusivity of liquid vapour in gas. State the assumptions made clearly. **8**

   b) Hydrogen gas at 3 atm and 25°C flows through a pipe of unvulcanized rubber with ID = 50 mm and OD = 75 mm, the solubility of hydrogen at 273°K and 1 atm pressure is 0.053 $cm^3/cm^3$ atm and diffusivity of hydrogen through rubber is $1.8\times10^{-10}$ m/s. Estimate rate of loss of hydrogen per m length of pipe. **6**

   c) Briefly discuss "Knudson diffusivity". **2**

OR

2. a) Under steady state conditions, oxygen is diffusing through nondiffusing carbon monoxide at 273 K and under total pressure of 101.3 $KN/m^2$. The partial pressure of oxygen at two planes 0.3 cm. apart is 13.5 $KN/m^2$ and 6.5 $KN/m^2$. If the diffusivity for the mixture is $1.85\times10^{-5}$ $m^2/s$ calculate the rate of diffusion of oxygen through one square meter of two planes. **6**

   b) Explain Maxwell law of diffusion along with equation. **4**

   c) Explain "Wilke and Chang" empirical correlation for dilute solution containing nonelectrolytes to calculate diffusivity. **4**

   d) Briefly discuss molecular diffusion and eddy diffusion. **2**

**P.T.O.**

3. a) Derive the relationship between overall mass transfer coefficient and (individual) local mass transfer coefficient based on the two resistance film concept. Draw a equilibrium distribution curve, considering 'p' point ($Y_{AG}$, $X_{AL}$), show overall concentration differences, interfacial composition etc. Final form of equation should be as follows : **12**

$$\frac{1}{k_y} = \frac{1}{k_y} + \frac{m^1}{k_x}$$

When rate of mass transfer is "gas phase controlled" and liquid phase controlled ?

b) Explain "cross flow cascades" using schematic diagram and draw three stages using graphical procedure. **4**

OR

4. a) In absorption column operating at 1 atm following data of individual mass transfer coefficient is obtained.

$k_y$ = 1.06 kg mole/$m^2$ hr

$k_y$ = 23 kg mole/$m^2$ hr

The equilibrium composition of gases and liquid phase is given by Henry's law. **8**

$P^* = \mathscr{H} c$, $P^* = 0.08 \times 10^6 \times$ mm Hg

Determine overall mass transfer coefficients ($K_x$, $K_y$).

b) Air flows through cylindrical tube made up of component A (solute) at velocity 6 m/s. The diameter of tube is 0.2 m and air temperature 293 K, using Gilliland and Sherwood correlation, calculate mass transfer coefficient for transfer of component A (solute) to air. **8**

Viscosity of air = $\mu_{(air)} = 1.8 \times 10^{-5}$ kg/ms

Density of air = $\rho_{Air} = 1.2$ kg/$m^3$

Diffusivity = $D_{AB} = 4.24 \times 10^{-6}$ $m^2$/s.

5. a) A counter current plate absorption column is used for absorption of $SO_2$ from air, the concentration of $SO_2$ is expected to reduce from 5.5 to 0.3%. The solvent used is fresh and it enters top of the column, gas stream enters at bottom at flow rate 2.4 $m^3$/s, column operates at 293 K and 1 atm. Following equilibrium data is obtained. **10**

| **X (Kmole/ Kmole of solvent** | 0 | 0.005 | 0.010 | 0.020 | 0.030 | 0.040 | 0.045 |
|---|---|---|---|---|---|---|---|
| **Y Kmole $SO_2$/Kmole air** | 0 | 0.002 | 0.005 | 0.015 | 0.032 | 0.053 | 0.065 |

Determine the minimum flow rates needed for fresh solvent. If the actual fresh solvent flow rates 1.2 times the minimum estimate number of ideal plates.

b) Write a note on "choice of solvent for absorption". **4**

c) Write a note on "Absorption with chemical reaction". **4**

OR

6. a) It is desired to absorb 80% of the acetone in a gas containing 1 mole% acetone in air in counter current stage tower. The total inlet gas flow rate to the tower is 30 kg mole/hr and total inlet pure water flow to be used to absorb the acetone is 90 kg mole $H_2O$/hr. The process is to operate isothermally at 300 K and in a total pressure of 101.3 KPa. The equilibrium relationship for acetone (A) in the gas liquid is $Y_A = 2.53\ X_A$. Determine number of theoretical stages. **14**

b) Explain minimum liquid-gas ratio for absorber. **4**

SECTION – II

7. a) Sheet material, measuring $1m^2$ and 5 cm thick, is to be dried from 45% to 5% moisture under constant drying conditions. The dry density of the material is 450 kg/$m^3$ and its equilibrium moisture content is 2%. The available drying surface is 1 $m^2$. Experiments showed that rate of drying was constant at 4.8 kg (hr.) $m^2$ between moisture content of 45% and 20% and there after the rate decreased linearly calculate the total time required to dry the material from 45% to 5%. All the moisture contents are on wet basis. **10**

b) Classify the different equipments used for drying operation. Explain continuous drying equipments. **6**

OR

8. a) 100 kg of solids contains 35% of moisture is to be dried in tray type dryer to reduce the moisture content upto 15% by passing a air at 350°K across the surface at a velocity of 2.1 m/sec. of initial rate of drying under these conditions was $0.75\times10^{-3}$ kg/$m^2$ sec. and critical moisture content was found 20%. Calculate the drying time required. (Data : surface area is $0.04m^2$/kg. on dry basis), equilibrium moisture content, $X^* = 0$. **10**

b) Explain the following terms using schematic representation : **6**

i) Equilibrium moisture ii) Bound moisture

iii) Free moisture.

9. a) What is wet bulb depression ? Define the following terms : **8**

i) Percentage relative saturation ii) Wet bulb temperature

iii) Absolute humidity.

b) For air water vapour mixture having dry bulb temperature of 60°C, calculate wet bulb temperature using following data : **4**

$Y^1$ = 0.0247 kg $v_{ap}$/kg dry air

$Y_W^1$ = 0.037 kg $v_{ap}$/kg of dry air

$\lambda_W$ = 2419.3 KJ/kg

Psychrometric ratio = 950 J/kg.

c) Explain with neat sketch "construction of natural draft cooling tower". **4**

OR

10. a) With schematic diagram of P Vs T, explain vapour pressure curve for a pure substance and its importance with special reference to humidification operation. **5**

b) Explain along with neat sketch "operating diagram" for cooling tower, also explain "Range" and "Approach" for cooling tower based on operating diagram. **5**

c) Write a note on "Evaporative cooling" and "Forced draft cooling tower". **6**

11. a) List out different operating characteristics of sieve trays, with neat sketch explain the terms : **10**

i) Flooding ii) Priming iii) Coning

iv) Weeping v) Dumping

b) Explain sparged vessel (Bubble column) device to introduce a stream of gas into liquid considering following points : **8**

i) Size of bubble (gas) and its dependency of flow rate.

ii) Terminal velocity of single bubble.

iii) Gas hold up.

iv) Specific interfacial area.

OR

12. Write a note on (**any three**) : **18**

i) Different types of packing used in packed column.

ii) Venturi scrubber.

iii) Wetted wall towers.

iv) Packing selection and its characteristics.

v) Comparison of packed tower $V_S$ tray tower.

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**[3863] – 104**

# T.E. (Chemical) (Semester – I) Examination, 2010
## 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 Gasket selection and classification. **4**

   b) A pressure vessel having outer diameter 1.25 m and height 3.8 m is subjected to an internal pressure of 1 $MN/m^2$. If the vessel is fabricated as class B vessel, joint efficiency is 85%, if the vessel is fabricated as class C vessel, welded joint efficiency is 70% and 50% and if the vessel is provided with a strip all along the longitudinal joint, joint efficiency is find out how much is the % material saving by welding a strip along the longitudinal joint. Allowable stress for the material is 100 MPa. **10**

   c) Discuss the proportionating of pressure vessels. **4**

   OR

2 a) Write a note on selection and design of various types of heads for pressure vessels. **8**

b) A pressure vessel has inside diameter 1470 mm and a plate thickness of 5 mm. Inside diameter of flange is 1482 mm. A gasket is provided over the flange face. Gasket factor is 2.0 and the gasket seating stress is 120 kg/cm$^2$ . Inside diameter of gasket is 1485 mm

Pressure inside the vessel is 2.5 kg/cm$^2$ permissible stress in bolts under atmosphere condition is 600 kg/cm$^2$.

Permissible stress in bolt's at operating condition is 550 kg/cm$^2$. Diameter of bolt is 20 mm. Calculate :

i) The bolt load

ii) Bolt area

iii) Flange thickness. **10**

3. Skirt support is to be designed for tall vertical vessel having diameter 2.5 m and height 37 m skirt diameter is equal to the diameter of the vessel while the skirt height is 3.5 m. The weight of the vessel with all its attachments is 2,22,000 kg. The minimum weight of the vessel is 1,70,000 kg. The wind pressure acting over the vessel is 130 kg/m$^2$.

Seismic coefficient = 0.08,

K for cylindrical vessel = 0.7

Permissible tensile stress of material = 1400 kg/ cm$^2$ Yield stress of the material = 2000 kg/cm$^2$.

Permissible stress for concrete = 45 kg/cm$^2$.

Bolt circle diameter is 32 cm greater than the skirt diameter. No. of bolts to be used 24. **16**

OR

4. a) Explain auto frettage and shrink fit construction for high pressure vessels. **6**

   b) A vessel is to be designed to withstand an internal pressure of 150 $MN/m^2$. An internal diameter of 30 cm is specified, and steel having yield point of 450 $MN/m^2$ has been selected. Calculate the wall thickness required by the various theories with a factor of safety 1.5 and $\mu = 0.3$. **10**

5. a) Explain saddle support and with neat sketch show various proportions for a Saddle support. **6**

   b) Design a Saddle support for a horizontal vessel using following data :

   Material – low carbon steel, Vessel diameter = 1230 mm

   Length of shell = 8000 mm, shell thickness = 10 mm

   Working pressure = 0.5 $N/mm^2$, head thickness = 12 mm

   Torispherical head crown radius = 1230 mm,

   Knuckle radius = 75 mm, total head depth = 257 mm, corrosion allowance = 1.5 mm, permissible stress = 95 $N/mm^2$ weight of the vessel and contents = 119G30 N, Distance of saddle centre line from shell end = 320 mm, included angle = 120°**.** **10**

OR

6. a) Explain detailed design procedure for design of cylindrical storage vessel with cone roof. **8**

   b) A storage vessel is to be covered by using a conical roof. Check the suitability of 10 mm thick plates for the construction of conical roof with permissible slope of 1 in 5. Superimposed load = 1250 $N/m^2$, density of steel = 7700 $kg/m^3$. Dia of vessel is 10 m. If the plates are not suitable, suggest the required thickness for roof plates. **8**

SECTION – II

7. A light oil is to be cooled in a 1:2 shell and tube heat exchanger at a rate of 54430 kg/hr from 200°C to 76°C. Cooling tower water is used as cooling medium which is available at 32°C and can be heated upto 64°C.

   Tubes of 19 mm OD and 16 ID are available with 16 ft. length. Use the following data – properties of light oil –

   Specific heat = 2345 J/kgK, Density = 850 kg/$m^3$ viscosity = 2 Cp, thermal conductivity = 0.142 w/mK properties of water – specific heat = 4187 J /kg k, density = 1000 kg/$m^3$ thermal conductivity = 0.623 W/mK, viscosity = 0.68 Cp. Fouling resistance on both sides may be taken as 0.0004 $m^2$K/W. Metal wall resistance can be neglected . As a first estimate take overall heat transfer coefficient as 450 W/$m^2$K. Design the exchanger in detail. **18**

OR

8. 0.8 kg/sec of furnace oil is to be heated from 10° to 90°C in a shell and tube heat exchanger. Heating is done by steam available at 120°C. Oil is circulated through the tubes. While steam is circulated in shell, tubes of 16.5 mm ID and 19 mm OD are available. Length of tubes = 3 m.

   The film coefficient of heat transfer for oil is 90 W/$m^2$ k while film coefficient of heat transfer for condensing steam is 7400 W/$m^2$k. Density of furnace oil = 900 kg/$m^3$.

   Specific heat of furnace oil = 1970 J/kgK

Fouling resistance for furnace oil = 0.0009 $m^2k/W$

Fouling resistance for steam side = 0.00005 $m^2k/W$.

Suggest a suitable design of the shell and tube heat exchanger.

Maximum oil velocity that can be used is 0.05 m/sec. Estimate the number of passes on tube side required in a heat exchanger. **18**

9. 4 kg/s of liquid with 10% solids available at 21°C is to be concentrated to 50% solids. The vacuum can be used at 13.3 $kN/m^{2.}$ BPR of the solution can be neglected. The heat capacity of the solution = 4180 J/kg K. Temperature of steam at 205 $kN/m^2$ = 121°C temperature of vapour at 13.3 $kN/m^2$ = 52°C.

Latent heat of steam at 52°C = 2377 kJ/kg.

Latent heat of steam at 121°C = 2200 kJ/kg

O.D of tubes = 75 mm, length of tube = 2.0m,

Down corner area is 70% of total c/s area.

Tubes are arranged on square pitch with centre to centre distance equal to 1.25 times the OD of the tube.

Design the evaporator as triple effect with backward feed arrangement.

Overall heat transfer coefficients are as follows $U_1$ = 2500 $W/m^2k$,

$U_2$ = 2000 $W/m^2k$, $U_3$ = 1600 $W/m^2k$. **16**

OR

10. a) Write a short note on Bayonet heat exchanger. **6**

b) A looped flow arrangement plate heat exchange is used to cool viscous liquid from 95°C to 60°C. The water is available at 18°C and outlet temperature of water is 45°C. The mass flow rate of viscous fluid is 2.6 kg/sec. Plates are made up of stainless steel. Plate thickness = 1 mm. Projected heat transfer area of plate = 0.2 $m^2$.

Effective width between plates = 0.4 m

Distance between centres of inlet and outlet ports = 0.8 m, Gasket thickness = 3 mm.

Properties :

| | **Hot fluid** | **Water** |
|---|---|---|
| Viscosity NS/$m^2$ | 0.1230 | $0.78\times10^{-3}$ |
| Specific heat J/kg k | 2512 | 4180 |
| Thermal conductivity W/mk | 0.1731 | 0.62 |

Neglecting the viscosity correction factor find out the overall heat transfer coefficient for the exchanger. **10**

11. a) Explain in detail the pressure filters and state their advantages and disadvantages **8**

b) What is the maximum safe speed of rotation of phosphor -bronze centrifuge basket 0.3 m diameter and 5 mm thick, when it contains a liquid of density 1000 kg/$m^3$. Forming a layer 75 mm thick at the walls. Take density of phosphor bronze as 8900 kg/$m^3$ and safe working stress as 55 MN/$m^2$. **8**

OR

12. a) Explain the process of filtration in rotary drum filter. **6**

    b) The rotary drum filter 1.2 m diameter and 1.2 m long can handle 6 kg/s. of slurry containing 10% solids when rotated at 0.05 Hz. By increasing the speed to 0.008 Hz it is found that it can handle 7.2 kg/s. What will be the percentage change in the amount of wash water which can be applied to each kilogram of cake caused by this increase of speed. What are the limitations to increased production by increase in the speed of rotation of the drum and what is the theoretical maximum quantity of slurry which can be handled. ? **10**

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# T.E. Chemical (Semester – I) Examination, 2010
## 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) Determine the fugacity and fugacity coefficient for n-octane vapor at 427.85 K and 0.215 MPa. The van der Waals constants for n-octane are a = 3.789 Pa $(m^3/mol)^2$ and b = $2.37\times10^{-4}$ $m^3/mol$. Volume of vapour = $15.675\times10^{-3}$ $m^3/mol$. **8**

   b) Explain various methods of determination of partial molar properties. **8**

OR

2. a) In a laboratory 2000 $cm^3$ of an antifreze solution consisting of 30 mol % methanol in water is to be prepared. What volumes of pure methanol and of pure water at 298.15 K must be mixed to form the 2000 $cm^3$ of antifreeze, also at 298.15 K ? Partial molar volumes of methanol and water in a 30 mol% methanol solution and their pure species molar volumes both at 298.15 K are

   Methanol (1) : $\bar{v}_1 = 38.632\,cm^3/mol$ , $v_1 = 40.727\,cm^3/mol$

   Water (2) : $\bar{v}_2 = 17.765\,cm^3/mol$ , $v_2 = 18.068\,cm^3/mol$ **8**

   b) Prove that $\mu_i = \left[\frac{dE}{du_i}\right]_{s,v,nj}$ . **8**

**P.T.O.**

3. a) Explain property changes of mixing and derive equations for $\Delta G$, $\Delta H$, $\Delta V$ and $\Delta S$. **8**

   b) The following is a set of VLE data for the system acetone (1)/methanol (2) at 328.15 K. Find values of $\ln\gamma_1$, $\ln\gamma_2$ and $GE/RT$ and plot those values against $x_1$.

| P/kPa | $x_1$ | $y_1$ | P/kPa | $x_1$ | $y_1$ |
|---|---|---|---|---|---|
| 68.728 | 00 | 00 | 98.462 | 0.5432 | 0.6174 |
| 75.279 | 0.0570 | 0.1295 | 99.950 | 0.6605 | 0.6926 |
| 78.951 | 0.1046 | 0.2190 | 100.999 | 0.7752 | 0.7729 |
| 86.762 | 0.2173 | 0.3633 | 99.877 | 0.9080 | 0.8959 |
| 93.206 | 0.3579 | 0.4779 | 96.885 | 1.000 | 1.000 |
| 96.365 | 0.4480 | 0.5512 | | | |

**10**

OR

4. a) The excess Gibbs free energy is given by $\frac{GE}{RT} = -3x_1x_2(0.40x_1 + 0.5x_2)$. Find expressions for $\ln\gamma_1$ and $\ln\gamma_2$. **10**

   b) Explain the importance of Gibbs-Duhem equation and give its various forms. **8**

5. Assuming Raoults law to be valid, prepare a P–x–y for a temperature of 363.15 K and t–x–y diagram for a pressure of 90 kPa for Benzene (1) and ethyl benzene (2) system.

   Antoine equation $\ln P^{sat} = A - \frac{B}{T + C}$, P in kPa and T in k.

| **Component** | **A** | **B** | **C** |
|---|---|---|---|
| Benzene | 13.8594 | 2773.78 | -53.08 |
| Ethyl benzene | 14.0045 | 3279.47 | -59.95 |

**16**

OR

6. a) A liquid mixture of cyclohexane (1)/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.
   - $\ln \gamma_1 = Ax_2^2$, $\ln \gamma_1 = Ax_1^2$
   - At 417.15 K, $P_1^{sat} = 75.20$ and $P_2^{sat} = 31.66$ kPa
   - The system forms an azeotrope at 417.15 K for which $x_1^{az} = y_1^{az} = 0.294$. **10**

   b) Write a note on effect of temperature on P–x–y diagram. **6**

SECTION – II

7. a) Show that at constant T and P, the condition for stability for a single phase binary system is given as $\frac{d \ln \gamma_1}{dx_1} > -\frac{1}{x_1}$. **10**

   b) Explain in brief the three types of constant pressure liquid/liquid solubility diagram. **6**

OR

8. a) Explain the following two methods of consistency tests for VLE data.
   i) Using the slope of $\ln \gamma_1$ curves. ii) Redlich-Kister method. **10**

   b) With neat sketches explain the difference between triple point and entectic temperature. **6**

9. a) The equilibrium constant at 420 k for the vapor phase hydration of ethylene to ethanol according to the reaction $C_2H_4 + H_2O \rightarrow C_2H_5OH$ is $6.8 \times 10^{-2}$ and standard heat of reaction at 298 K is $-45.95 \times 10^3$ J. The specific heat data are as follows.

| Component | $\alpha$ | $\beta$ | $\gamma$ |
|---|---|---|---|
| Ethylene | 11.886 | $120.12 \times 10^{-3}$ | $-36.449 \times 10^{-6}$ |
| Water | 30.475 | $9.652 \times 10^{-3}$ | $1.189 \times 10^{-6}$ |
| Ethanol | 29.358 | $166.9 \times 10^{-3}$ | $-50.09 \times 10^{-6}$ |

   Formulate general relationship for estimating the equilibrium constant and standard free energy change as functions of temperature. **14**

   b) Comment on feasibility of a chemical reaction. **4**

OR

10. a) A system initially containing 2 mol $C_2$ $H_4$ and 3 mol $O_2$ undergoes the reactions

$$C_2H_4(g) + \frac{1}{2}O_2(g) \rightarrow \langle (CH_2)_2 \rangle O(g)$$

$$C_2H_4(g) + 3O_2(g) \rightarrow 2CO_2(g) + 2H_2O(g)$$

Develop expressions for the mole fractions of the reacting species as functions of the reaction coordinates for the two reactions. **8**

b) Calculate the equilibrium constant at 298K for the reaction

$$C_2H_4(g) + H_2O(g) \rightarrow C_2H_5OH(g)$$

| **Component** | **$S^0_{298}$, J/mol k** | **$H^0_{298}$, J/mol** |
|---|---|---|
| $C_2H_4$ (g) | 220.85 | 48986 |
| $H_2O$(g) | 189.12 | -241997 |
| $C_2H_5OH$(g) | 278.00 | -238941 |

**6**

c) List various methods used for the evaluation of equilibrium constant. **4**

11. a) Methanol can be produced according to the reaction $CO(g) + 2H_2(g) \rightarrow CH_3OH(g)$ Estimate the degree of conversion of CO(g) into methanol at 500 K and 5 bar if

a) An equimolar mixture of CO(g) and $H_2$(g) is fed to a reactor.

b) Stoichiometric mixture of CO(g) and $H_2$(g) is fed

c) CO(g) and $H_2$(g) in the ratio 1 : 4 enter the reactor.

The equilibrium constant for the reaction is $4.973 \times 10^{-3}$. **12**

b) Explain multireaction equilibria. **4**

OR

12. a) A stoichiometric mixture of $N_2$(g) and $H_2$(g) at 100 bar and 800 K enter a catalytic reactor for the synthesis of ammonia. Assuming that the gas phase is ideal, estimate the degree of conversion and the equilibrium composition. The equilibrium constant for the reaction at 800 K is $1.122 \times 10^{-5}$. **8**

b) Estimate the quilibrium composition and the degree of conversion if $C_2H_4$(g), $H_2O$(g), and argen in the mole ratio 1 : 1 :3 at 500 K and 40 bar enter a reactor for the production of ethanol. Assume that the reaction mixture behaves like an ideal gas. The equilibrium constant for the reaction at 500 K is $6.4 \times 10^{-2}$. **8**

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# T.E. (Chemical / Biotechnology) (Semester – II) Examination, 2010
## CHEMICAL REACTION ENGINEERING – I
## (2003 Course)

Time : 3 Hours Max. Marks : 100

***N.B.*** *: 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, electronic pocket calculator and steam tables is **allowed**.*

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

SECTION – I

1. a) Note various ways of expressing reaction rate. **8**

   b) A certain reaction has a rate given by

   $-r_A = 0.005\ C_A^2\ mol/cm^3 min$.

   If concentration is to be expressed in mol/lit and time in hours, what would be the value and units of the rate constant ? **8**

OR

2. a) Differentiate elementary vs non-elementary reactions. **8**

   b) On doubling the concentration of reactant, the rate of reaction triples. What is the reaction order ? **8**

**P.T.O.**

3. a) Draw and explain $X_A$ Vs t and $-r_A$ Vs $C_A/C_{AO}$ curves for auto catalytic reactions. **8**

   b) What are different ways to determine the extent of reaction at various times ? **8**

OR

4. Stoichiometry of decomposition of gaseous A is $A \rightarrow 2.5R$. From the data on constant volume batch reactor at 0°C using pure gaseous A, find a rate expression which satisfactorily represents the decomposition : **16**

| **Time min.** | 0 | 2 | 4 | 6 | 8 | 10 | 12 | 14 | ∞ |
|---|---|---|---|---|---|---|---|---|---|
| **Partial Pre. of A mmHg** | 760 | 600 | 475 | 390 | 320 | 275 | 240 | 215 | 150 |

5. Write notes on : **18**

   i) Differential vs integral analysis.

   ii) Analysis of total pressure vs time data obtained on a constant volume CSTR.

OR

6. Derive the performance equations of : **18**

   i) PFR

   ii) CSTR.

SECTION – II

7. Develop the concentration VS time curves for the reaction

   $A \xrightarrow{k_1} R \xrightarrow{k_2} S \quad C_{R_0} = C_{S_0} = 0$ occurring in CSTR. Derive and show that

   $\tau_{m,\,opt} = \dfrac{1}{\sqrt{k_1 k_2}}$. **16**

OR

8. Discuss product distribution in series and parallel reactions. **16**

9. Write in detail on optimum sequencing of available CSTRs and PFRs for carrying out a reaction with known kinetics. **16**

OR

10. Determine the equilibrium conversion for the following elementary reaction between 0°C to 100°C at 298 K :

$A \rightleftharpoons R \quad \Delta G^{\circ} = -14130\ J/mol\ ,\ \Delta H^{\circ}_{R} = -75300 J/mol\ C_{P_A} = C_{P_R} =$ constant

i) Construct a plot or temperature vs conversion.

ii) What restrictions should be placed on reactor operating isothermally if conversion of 85% or higher is desired ? **16**

11. Write notes on any **three** :

i) Tanks in series model.

ii) C, E and F curves.

iii) Dispersion model.

iv) Non-ideality in reactors. **18**

OR

12. A pulse of tracer of amount 3.7 mg is injected to a stirred vessel through feed stream. The following table shows the measured tracer concentration in outflow stream. Calculate mean residence time and generate E curve. The volumetric flow rate and hydraulic residence time are 0.5 *l*/s and 50 s respectively. **18**

| **Time sec.** | 0 | 10 | 20 | 30 | 40 | 50 | 60 | 70 | 80 | 90 | 100 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Conc. mg/l** | 0 | 0.1 | 0.3 | 0.6 | 0.7 | 0.65 | 0.6 | 0.4 | 0.1 | 0.08 | 0.04 |

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# T.E. (Chemical) (Semester – II) Examination, 2010
# CHEMICAL PROCESS TECHNOLOGY
## (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** diagram must be drawn **wherever** necessary.*
*4) Black figures to the **right** indicate **full** marks.*

SECTION – I

1. a) Discuss the production of $Na_2CO_3$. **10**

   b) Explain production of Magnesium from electrolytic process. **8**

   OR

2. a) Discuss various products recovered from sea water with applications. **10**

   b) Compare Diapharm Cell and Mercury Cell. **8**

3. a) Explain the production of single superphosphate. **8**

   b) Discuss the production of sulphur by oxidation-reduction process. **8**

   OR

4. a) Explain in detail production of $H_3 PO_4$ acid. **8**

   b) Write about production of $HNO_3$ acid. **8**

5. a) Discuss production of paperpulp. **8**

   b) Explain sugar production. **8**

   OR

6. Draw neat flow diagrams (**any two**) : **16**

   a) Production of Absolute Alcohol.

   b) Dextrin production.

   c) Paper making process.

**P.T.O.**

SECTION – II

7. a) Explain how oil is extracted from natural sources. **8**

   b) Discuss production of penicillin. **8**

OR

8. a) Discuss destructive distillation of coal. **8**

   b) Describe production of detegents. **8**

9. a) Explain (1) Alkylation (2) Isomerization. **12**

   b) Discuss production of water gas. **6**

OR

10. Draw neat flow diagram for (**any three**) : **18**

    1) Catalytic Reforming
    2) Hydrogenation
    3) Production of Producer gas
    4) Fuel Cell
    5) Hydroalkylation.

11. a) Discuss production of styrene **10**

    b) Draw and explain PFD for production of Methanol. **6**

OR

12. Draw detail flow diagram (**any two**) : **16**

    1) Production of ethylene.
    2) Production of Phenol by toulene oxidation
    3) Production of Cumene
    4) Production of formaldehyde.

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**[3863] – 109**

# T.E. (Chemical/ Biotechnology) (Semester – II) Examination, 2010
# MASS TRANSFER – II
# (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) Your answers will be valued as a whole.*
*5) Assume suitable data, if necessary.*

SECTION – I

1. a) Derive the Rayleigh equation for differential distillation. **6**

   b) 1000 kg moles/hr of an ethanol propanol mixture containing 65 moles percent ethanol is to be extracted in a continuous plate column operating at 1 atmosphere total pressure. The desired terminal compositions in units of mole fraction of ethanol are $x_0 = 0.92$ and $x_w = 0.07$

   The feed is saturated vapour and total condenser is used. When the reflux flow rate is four times the amount of top product, find the number of theoretical plates required for the separation. Relative volatility of ethanol propanol system may be taken as = 2.10. **10**

OR

2. a) Compare azeotropic and extractive distillation in short. **4**

   b) 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 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. **12**

**P.T.O.**

3. a) A solution of nicotine in water containing 1% nicotine is to be extracted with kerosene at 293°K (20°C). Water and kerosene are essentially insoluble. Assume the equilibrium relationship to be Y =0.9 X.

   where Y = kg nicotine /kg kerosene and X = kg nicotine/ kg water

   i) Determine the percentage extraction of nicotine if 100 kg of a feed solution is extracted with 150 kg f solvent (kerosene)

   ii) Repeat for three theoretical extractions using 50 kg solvent each time. **12**

   b) Explain the selection criteria for solvent for liquid-liquid extraction. **6**

OR

4. a) A solution containing 5% acetaldehyde and 95% toluene is to be extracted with water in five stage cross current extraction unit to extract acetaldehyde. The toluene and water are essentially insoluble. If 25 kg of water each time are used per 100 kg of feed, calculate the amount of acetaldehyde extracted and the final concentration of the exit solution. The equilibrium relationship is given as Y = 2.20 X.

   where Y =kg acetaldehyde/ kg water and X = kg acetaldehyde/kg toluene. **12**

   b) Give the classification of liquid-liquid extraction equipments. **6**

5. A solution of washed raw cane sugar is coloured by the presence of impurities. It is to be decolourized by treatment with an adsorption carbon in a contact filtration plant. The data for an equilibrium isotherm is given below. The original solution has a colour concentration of 9.6 measured on an arbitrary scale and it is desired to reduce the colour to 0.96. Calculate the necessary dosage of fresh carbon per 2000 kg solution.

a) For a single stage process

b) For a three stage countercurrent operation

| **kg Carbon / kg Solution** | 0 | 0.001 | 0.004 | 0.008 | 0.02 | 0.04 |
|---|---|---|---|---|---|---|
| **Equilibrium Colour** | 9.6 | 8.6 | 6.3 | 4.3 | 1.7 | 0.7 |

OR

6. a) Explain the nature of adsorbents. **6**

b) State the application of adsorption. **2**

c) State and explain principles of ion exchange. **8**

SECTION – II

7. a) Derive an expression for the determination of number of stages required in case of multistage countercurrent leaching. **12**

b) Write short note on factors affecting solid-liquid extraction. **6**

OR

8. a) Crushed oil seed containing 55% oil by weight are to be extracted at the rate of 4000 kg/hr using 6000 kg/hr of hexane containing 5% oil by weight as the solvent. A countercurrent two stage extraction system is used. The oil seed retain 1 kg of solution per kg of oil free cake. Calculate the percent recovery of oil (based on the original feed) obtained under the above conditions. **12**

b) Write material balance of single stage leaching system. **6**

9. a) Calculate the yield of $MgSO_4 . 7 H_2O$ crystals when 1000 kg saturated solution of $MgSO_4$ at 353 K (80° C) is cooled at 303 K (30° C) assuming 10% of the water is lost by evaporation during the cooling.

   Data : Solubility of $MgSO_4$ at 353 K (80°C) = 64.2 kg/100 kg water

   Solubility of $MgSO_4$ at 303 K (30°C) =40.8 kg/100 kg water

   At wt : Mg = 24, S = 32, H =1 and O =16. **10**

   b) State and explain working principles of vacuum crystallizer. **6**

OR

10. a) Describe methods of supersaturation and state Mier's supersaturation theory. **10**

    b) Write material and enthalpy balance of crystallization operation. **6**

11. a) Explain reverse osmosis with neat sketch. **6**

    b) Define nanofiltration and give industrial applications. **6**

    c) State membrane material selection criteria. **4**

OR

12. a) Write classification of membrane processes. **8**

    b) Explain with neat sketch hollow fibre membranes for gas permeation. **8**

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# T.E. (Chemical/Bio technology) Semester – II Examination, 2010
# INDUSTRIAL ORGANISATION 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.*

SECTION – I

1. a) Define management. Explain various functions of management. Describe the role of manager in a changing global business scenario. **10**

   b) State and explain Henry Fayol's theory of management. **6**

   OR

2. a) Briefly explain different forms of business organisations. Explain the formation and functions of joint stock company. **10**

   b) Explain how functional organisation is an improvement over line and staff organisation ? Justify your answer. **6**

3. Differentiate between job evaluation and merit rating. Explain various methods of merit rating. **16**

   OR

4. a) What is industrial fatigue ? What are the different mechanism to reduce it ? **6**

   b) Define motivation. Explain Maslow's theory of motivation. **10**

**P.T.O.**

5. a) What is economic order quantity ? How it is derived ? Explain the importance of inventory control. **8**

   b) Explain following :
      i) LIFO & FIFO
      ii) Tenders and quotations
      iii) Inspection and quality control. **10**

OR

6. a) State and explain the qualitative or selective methods of inventory control. **10**

   b) Describe the functions of store keepers. How they leverage profit ? **8**

SECTION – II

7. Define marketing. What is market-mix ? Explain various methods of market research. **16**

OR

8. a) Differentiate between penetration prices and skimming prices. Under what circumstances these pricing methods are applied ? **10**

   b) State and explain the role of advertising and sales promotion for a FMGC product. **6**

9. a) Describe the importance of international trade in the context of liberalised world market. **8**

   b) Explain following : **8**
      i) Antidumping duty
      ii) Patent and copyright.

OR

10. a) Define quality. Explain the concept of TQM with its functions and importance. **10**

    b) Explain following : **6**
       i) Export promotion council
       ii) ISO-9000 series.

11. a) State and explain the salient features of contract act. Explain various types of contract. **10**

    b) Explain the following : **8**

    i) MRTP

    ii) FERA.

OR

12. a) Define work study. What are the different elements of work study ? Explain objectives and procedures of work study. **10**

    b) Differentiate between outline process chart and flow process chart. Explain various types of flow process chart with its characteristics. **8**

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# T.E. (Petroleum) (Semester – I) Examination, 2010
# DRILLING AND PRODUCTION OPERATIONS
# (2003 Course)

Time : 3 Hours Max. Marks : 100

***Instructions :*** *1) Question Nos.* ***1*** *and* ***5*** *are* ***compulsory****. Out of the remaining attempt* ***2*** *questions from Section* ***I*** *and* ***2*** *questions from Section* ***II****.*
*2) Answers to the* ***two*** *Sections should be written in* ***separate*** *books.*
*3)* ***Neat*** *diagrams must be drawn* ***wherever*** *necessary.*
*4) 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) Discuss components of drill string with suitable sketch. **9**

   b) Write different types and uses of horizontal and multilateral wells. **6**

   c) Convert polar co-ordinate to rectangular 165° Azimuth and radius 255 M. **3**

2. a) Discuss functions of drilling fluid in detail. **8**

   b) Calculate mud gradient 11 ppg and 13 ppg. **2**

   c) Calculate B.H.P. if well depth 10,000 ft and mud weight 11.5 ppg. **2**

   d) Define 'ECD' Equivalent circulating density. **2**

   e) Discuss the use of Fann viscometer. **2**

3. a) Draw $13\frac{3}{8}''$ Bop stack and discuss different ram types in detail. **8**

   b) Discuss any one down hole problem in detail. **8**

**P.T.O.**

4. a) Calculate volume of oil required to reduce the hydrostatic pressure in a well by 450 psi Mud weight = 11 ppg Hole depth = 10,000 ft Drill pipe O.D = $5''$ I.D. = $4.276''$ Hole size = $12.25''$ density of oil = 7 ppg. **8**

   b) Write short note on : **8**

      i) Overshot

      ii) Conventional coring.

SECTION – II

5. a) What are different work over problems, discuss any two in detail. **10**

   b) Discuss two stage cementation with suitable sketch. **8**

6. a) Draw well head assembly and indicate all the parts. **8**

   b) Describe the following properties of oil well cement in brief. **8**

      i) Thickening time

      ii) Strength of cement

      iii) Permeability of set cement

      iv) Density.

7. a) Discuss components of completion string in detail. **10**

   b) Discuss different types of casing in brief. **6**

8. Write short note on : **16**

   i) Work over fluid

   ii) DST

   iii) Perforation

   iv) X-Mas tree.

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# T.E. (Petroleum) (Semester-I) Examination, 2010
# PETROLEUM FIELD INSTRUMENTATION AND CONTROL
# (2003 Course) (Old Syllabus)

Time : 3 Hours max. 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 **whereever** necessary.*

## SECTION – I

1. a) What do you understand by the term calibration of an instrument? Why it is necessary? How it is carried out? State sources of errors. Explain with suitable example. **8**

   b) Explain the term fidelity, dynamic error, speed of response and measurement lag. **8**

2. a) Explain the Classification of flowmeters. Explain how will you use the area type flowmeter if its working fluid is changed. **8**

   b) Explain the classification of Pressure measuring instruments. **8**

3. a) Write Short note on Electro-pneumatic converter. **8**

   b) Explain any one method for measurement of vacuum. **8**

4. a) Explain the Instrumentation involved in surface production operation. **6**

   b) Describe with proper sketch the instrumentation in gas gathering station. **6**

   c) How will you measure Temperature of oil wells? **6**

**P.T.O.**

## SECTION – II

5. a) What is transfer function? What is the significance of deriving a transfer function for a system ? **6**

   b) Define time constant. How will you experimentally find a time constant of a first order system? Give example. **6**

   c) Explain the relationship between magnitude of overshoot and controller settings. **6**

6. a) Explain the Proportional control action. How the proportional control action can be used in controller tuning? **8**

   b) Explain with the help of proper symbolic sketch, the flow control feedback loop having pneumatically activated globe valve as its final control element. **8**

7. a) What are different types of valves used in Petroleum industry? How will you obtain inherent valve characteristics in a laboratory? **8**

   b) Explain the Ratio control strategy with application in Petroleum industry. **5**

   c) Give examples of Servo and Regulatory problem. **3**

8. a) What is the difference between conventional feedback loop and a Programmable logic controller? **5**

   b) What are the components of a SCADA system? Explain how a SCADA system works? **6**

   c) Draw a sketch of distillation column control with reference to inventory, product quality and pressure control. **5**

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# T.E. (Petroleum) (Semester – II) Examination, 2010
# PETROLEUM GEOLOGY – II
# (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.*

SECTION – I

1. A) Explain the terms: sour gas, sweet crude, gas hydrate, porphyrins, and geochemical fossils. **15**

OR

1. A) With the help of neat diagrams give important types of surface and subsurface occurrences of petroleum. **10**

B) Explain one chemical and one genetic classification of oil field water. **5**

2. A) Under what conditions organic matter is broken down in a sedimentary basin ? **6**

B) Compare the change that take place during diagenesis of clastic sediments and the organic matter accumulated within them in a typical marine environment. **9**

OR

2. Give geochemical aspects of transformation of organic matter to hydrocarbons in nature with the help of neat diagrams. **15**

3. Answer **any two** of the following : **20**

A) Give evidences of primary and secondary migration.

B) Give a classification of ‘traps’. Describe various types of structural traps with the help of neat sketches.

C) Write a detailed note on “Kerogen”.

**P.T.O.**

SECTION – II

4. A) Explain in brief important marine environments of deposition of carbonates with sketches. **15**

OR

4. Write notes on **any three** of the following : **15**
   a) Diagenesis of carbonate sediments
   b) Types of carbonate porosity
   c) Maturation of hydrocarbons in reservoir rocks
   d) Unconventional hydrocarbon resources
   e) Explain the concept of 'NELP' Rounds in India.

5. Describe geology and hydrocarbon potential of any one of the hydrocarbon producing basins of India. **15**

6. Answer the following : **20**
   A) List and explain important duties of a wellsite geologist.
   B) Describe in brief the procedure to carry out analysis of drill cuttings.

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**[3863] – 117**

# T.E. (Petroleum Engineering) (Semester – II) Examination, 2010
# 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) Question No. **1** and No. **7** is **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. Derive the radial flow equation for turbulent gas flow. **18**

2 a) Draw the stress strain diagram for steel, cast iron, limestone and shale. Explain all the important points on the graph. **8**

b) What is Mohrs diagram ? Explain its usefulness. **6**

c) What is the engineering classification of naturally fractured rocks ? **2**

3. Define Rs, Bo, co, $\mu o$, Bg, $\mu g$, cg, Bw, cw and explain each with a variation in pressure. State SI units of each and their approximate range. **16**

4. a) Define Saturation and Porosity and explain one method for their measurement. **6**

b) Write a note on relative permeability. **5**

c) Derive an expression for gas flow in porous media. **5**

**P.T.O.**

SECTION – II

5. a) Draw and explain PV, PT, P-x P-density diagrams for a single, dual and multi-component system. **10**

   b) Explain retrograde vaporization and condensation process. **6**

6. a) What are K values ? Explain. **4**

   b) What is flash and differential liberation process ? **4**

   c) Explain in detail how a flash calculation is done. **8**

7. a) Define capillary pressure, wettability. What is its importance to Petroleum Engineering ? **9**

   b) Explain one method to measure the above properties. **9**

8. a) Derive the Redlich Kwong EOS in terms of Z. What is Zv and Zl ? **10**

   b) What is the significance of three values of Z ? If four values were obtained, what would their significance be ? **6**

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# T.E. (Petroleum) (Semester – II) Examination, 2010
# PRINCIPLES OF CHEMICAL ENGINEERING – II
# (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) **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) With help of neat diagram explain different parts of a tray column. **6**

   b) Compare merits and demerits of packed tower and tray towers. **6**

   c) Define : Relative Volatility, Mass Transfer coefficient. **4**

   OR

2. Methanol (A) - water (B) solution containing 50 wt% methanol at 26.7°C to be continuously rectified at 1 atm at a rate of 5000 kg/h to provide a distillate containing 95% methanol and residue containing 1.0% methanol (by weight). The feed is preheated at 37.8°C. The distillate is totally condensed at bubble point. A reflux ratio of 1.5 times the minimum is to be used. Determine (a) quantity of products, (b) minimum reflux ratio, (c) minimum number of theoretical stages and (d) number of theoretical stages at the specified condition. **16**

| **x** | 0 | 0.1 | 0.3 | 0.4 | 0.6 | 0.8 | 0.9 | 1.0 |
|---|---|---|---|---|---|---|---|---|
| **y*** | 0 | 0.4 | 0.67 | 0.73 | 0.84 | 0.92 | 0.95 | 1.0 |

3. a) Obtain mathematical expression for Langmuir adsorption isotherm. Clearly state all the important assumptions. **8**

   b) "Membrane separations are very important" – Elaborate with help of suitable examples from industry as well as domestic applications. **8**

OR

4. a) What is Psychrometry chart ? Discuss its importance. **4**

   b) Briefly explain choice of solvent for Gas Absorption. **4**

   c) Discuss the analogy between Heat, Mass and Momentum Transfer. Write down Reynolds analogy and its usefulness. **8**

5. a) Write a short note on TEMA specifications and discuss importance. **8**

   b) Discuss with help of suitable examples the choice of fluids in tube side and shell side of a shell and tube heat exchanger. **6**

   c) Why baffles are used in heat exchangers ? **4**

OR

6. a) Write a short note on compact heat exchangers. **4**

   b) A speciality chemical S is to be cooled from 80°C to 40°C at a rate of 1500 kg/hr in a countercurrent double pipe heat exchanger, with water as coolant flowing through inner tube side. Raw water is available at 30°C and maximum temperature rise possible is of 10°C. **14**

      i) Obtain heat duty of the exchanger.

      ii) Calculate flow rate of raw water.

      iii) If overall heat transfer coefficient be 662.3 W/($m^2$.K), obtain the length of the required exchanger.

**Data :**

Inner Tube : ID = 21 mm, OD = 25.4 mm, $k_{wall}$ = 74.5 W/(m.K)

Outer Pipe : ID = 41 mm, OD = 48 mm

For Chemical S : $C_P$ = 1.88 kJ/(kg.°C), $\mu$ = 0.37 cP, $\rho$ = 860 kg/$m^3$ and k = 0.154 W/(m.K)

For raw water : $\mu$ = 0.77 cP and k = 0.613 W/(m.K)

SECTION – II

7. a) How river pollution can be tackled ? In this context highlight the main pollutants. **6**

   b) What is HAZOP study ? With a suitable example explain the HAZOP study also highlight its necessity. **6**

   c) Discuss the major pollutants for air. Indicate the immediate and long term impacts of these pollutants on human and animal life. **6**

OR

8. a) Discuss and explain : Ozone Layer Depletion, Green House Effect, Acid Rain. **8**

   b) What is BOD test ? Discuss its importance in effluent treatment. **4**

   c) What is lethal dose ? Discuss its importance. **6**

9. a) Write a short note on plot plan development. **4**

   b) With help of neat sketch discuss all the major sections of a typical Rig Layout. Highlight importance of the Rig. **8**

   c) Write a short note on plant process engineer and his duty and responsibility. **4**

OR

10. a) XYZ organization decided to set up a chemical plant for some speciality chemical. Discuss all the important factors to be considered while choosing appropriate location of the plant. Elaborate all the points appropriately. **8**

    b) Discuss in details the development of P&ID for a chemical process. In this context explain the need and usefulness of developed P&ID. **8**

11. a) Name four methods to check the health of process piping. Discuss any one of them in details. **6**

    b) Write down advantages of cross country piping over other methods of transport. **6**

    c) Write a short note on Assembly and Erection of Equipments. **4**

OR

12. a) How insulation is done for process pipelines - Discuss in brief. In this context name four different insulating materials. **6**

    b) Define economic diameter of a pipe - Explain its significance. **4**

    c) Describe construction and working of **(any two)** : **6**

    i) Needle Valve

    ii) Butterfly Valve

    iii) Gate Valve.

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# T.E. (Petroleum) (Semester – II) Examination, 2010
# DESIGN OF PETROLEUM MACHINERY
## (2003 Course)

Time : 3 Hours Max. Marks : 100

***Instructions :*** *1) Question Nos.* ***1*** *and* ***5*** *are* ***compulsory****. Out of the remaining attempt* ***2*** *questions from Section* ***I*** *and* ***2*** *questions from Section* ***II****.*

*2) Answers to the* ***two*** *Sections should be written in* ***separate*** *books.*

*3)* ***Neat*** *diagrams must be drawn* ***wherever*** *necessary.*

*4) 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) Discuss circulation system of a drilling rig with suitable sketch. Discuss design criteria of reciprocating pumps. **9**

   b) Discuss design criteria for oil and gas pipeline and explain Weymouth and Pranhandle equation for gas pipeline. **9**

2. 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 : **16**

   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 0.8 $N/mm^2$.

   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 where as rubber bush is 6 mm thick. Enlarge portion in input flange is having 24 mm diameter clearance of 5 mm is left in two halves of coupling.

**P.T.O.**

3. Write short notes on : **16**
   i) Reciprocating compressor
   ii) Working mechanism of any one type of break
   iii) Types of belt drives.
   iv) Stress concentrations.

4. A shaft is supported by two bearings at 1 m apart pulley is mounted at a distance of 300 mm to the right of left hand bearing and this drives a pulley directly below it with the help of belt having max tension of 2.25 KN. Another pulley 400 mm is placed 200 mm to the left of right hand bearing and is driven with help of electric motor and belt placed horizontal to the right. The angle of contact for both the pulleys is 180°. Take $\mu$ = 0.24. Determine the suitable diameter of solid shaft allowing the working stress 6 as 63 MPa in tension and 42 MPa in shear. Assume torque for one pulley equal to that of another pulley. **16**

SECTION – II

5. Calculate : **18**
   i) Thickness of shell
   ii) Total circumference
   iii) Assume width = 1800 mm and determine number of layers for shell.

   Data given as

   Tank diameter = 20 M, Tank height = 13 M (conical groove). Sp.gravity of liquid = 1.2 super imposed load = 1250 $N/m^2$.

   Material = cast iron, permissible stress = 142 $N/mm^2$

   Density of material = $7.8\times10^3$ $kg/m^3$

   Modulus of elasticity = $2\times10^5$ $N/mm^2$

6. a) Write in brief different types of storage tanks for storage of hydro carbons. **4**
   b) Different types of agitators used for mixing the liquids. **6**
   c) Discuss losses in storage of volatile fluids. **6**

7. a) Design a vessel with channel type jacket having diameter 100 mm and internal pressures are 0.5 $N/mm^2$ and 0.3 $N/mm^2$ in shell and jacket respectively. The jacket and shell are made up of steel having permissible stress 98 $N/mm^2$. **8**

   b) Write and explain heat transfer coefficient for jacketed reaction vessels. **4**

   c) Write note on TEMA code for heat exchangers. **4**

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

   a) Gasket and flanges

   b) Oil and gas separators

   c) Sulphur containing fluid.

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# [3863] – 121

## T.E. (Petrochemical) (Semester – I) Examination, 2010
## 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 involved in manufacture of ammonia. **6**

2. a) Describe with flowsheet the Solvay process for manufacture of soda ash. **10**

   b) Mention end uses of glycerine, hydrazine and urea. **6**

3. a) Describe with flowsheet the Raschig-Olin process for manufacture of hydrazine. **10**

   b) Describe any one process for manufacture of glycerine from propylene. **6**

4. a) Describe with flowsheet the Bergius process for conversion of coal to aromatic liquids. **10**

   b) Mention end uses of phosphoric acid, nitric acid and lime. **6**

SECTION – II

5. a) Describe with flowsheet the extraction process for manufacture of crystal sugar. **12**

   b) Write a note on by-products of sugar industry. **6**

**P.T.O.**

6. a) Describe with flowsheet the process for manufacture of ethanol by fermentation. **10**

   b) Write a short note on dyes and their classification. **6**

7. a) Describe with flowsheet the continuous hydrolysis and saponification process for manufacture of soap and glycerine. **10**

   b) Differentiate between soap and detergent and write a note on types of detergents. **6**

8. a) Describe with flowsheet how urea is manufactured by ammonium carbamate decomposition process. **10**

   b) Write a note on carbohydrates and their applications. **6**

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**[3863] – 122**

# T.E. (Petrochemical) (Semester-I) Examination, 2010
# MATHEMATICS FOR PETROCHEMICAL ENGINEERS
# (2003 Course)

Time : 3 Hours Max. Marks : 100

***Instructions*** *: 1) Answers to the **two** Sections should be written in **separate** answer books.*

*2) 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**. 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) **Neat** diagrams must be drawn **wherever** necessary.*

*4) Figures to the **right** indicate **full** marks.*

*5) **Use** of non - programmable electronic pocket calculator is **allowed.***

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

## SECTION – I

1. a) Determine all basic feasible solutions to the system of equations : **6**

$2x_1 - 3x_2 + 5x_3 = 10$

$6x_1 - 2x_2 + x_3 = 9$

b) Solve the following LP problem : **10**

Maximize : $z = 8x_1 + 11x_2$, subject to the constraints :

$3x_1 + x_2 \leq 7,$

$x_1 + 3x_2 \leq 8,$

$x_1, x_2 \geq 0$

OR

**P.T.O.**

2. a) A firm manufactures 3 products A, B, C. The profits are Rs. 5, 4 and 3 respectively. The firm has 2 machines $M_1$ and $M_2$ ; and given below is the required processing time in minutes for each machine on each product. **6**

**Product**

| | | A | B | C |
|---|---|---|---|---|
| **Machine** | $M_1$ | 2 | 3 | 5 |
| | $M_2$ | 4 | 3 | 3 |

Machine $M_1$ has 1500 minutes, where as $M_2$ has 2000 minutes available. The firm must manufacture 100 A's, 200 B's and 150 C's, but not more than 150 A's. Set up an L.P. problem, to maximize profit. Do not solve it.

b) Solve the following L.P. problem : **10**

Minimize $z = x_1 + x_2$, subject to the constraints :

$2x_1 + x_2 \geq 4$

$x_1 + 7x_2 \geq 7$

3. a) A car hire company has one car at each of its 5 depots a, b, c, d and A customer requires a car in each city A, B, C , D and E. Distance (in kms) between depots and cities are given in the following table. **6**

**Depots**

| | | **a** | **b** | **c** | **d** | **e** |
|---|---|---|---|---|---|---|
| **Cities** | **A** | 160 | 130 | 175 | 190 | 200 |
| | **B** | 135 | 120 | 130 | 160 | 175 |
| | **C** | 140 | 110 | 155 | 170 | 185 |
| | **D** | 50 | 50 | 80 | 80 | 110 |
| | **E** | 55 | 35 | 70 | 80 | 105 |

How should the cars be assigned to customer, so as to minimize the distance travelled ? Find also the min. distance travelled.

b) Find the optimal solution to the following transportation problem, by Vogel's Approximation Method (VAM). **10**

**Destination**

| | | X | Y | Z | **Supply** |
|---|---|---|---|---|---|
| | A | 8 | 7 | 3 | 60 |
| **Source** | B | 3 | 8 | 9 | 70 |
| | C | 11 | 3 | 5 | 80 |
| **Demand** | | 50 | 80 | 80 | |

OR

4. a) A company has 4 sales representatives who are to be assigned to 4 different sales territories. The monthly sales increase estimated for each sales representative for different sales territories (in lakh rupees), are shown in the following table : **8**

**Territories**

| | | I | II | III | IV |
|---|---|---|---|---|---|
| **Sales** | A | 200 | 150 | 170 | 220 |
| **Representatives** | B | 160 | 120 | 150 | 140 |
| | C | 190 | 195 | 190 | 200 |
| | D | 180 | 175 | 160 | 190 |

a) Find an optimal assignment to maximize the sales and the total maximum sales.

b) If for some reason, B cannot be assigned territory III, will the optimum assignment be different ?

b) Determine initial basic feasible solution to the following transportation problem, using Vogel's Approximation Method : **8**

| | $D_1$ | $D_2$ | $D_3$ | $D_4$ | **Supply** |
|---|---|---|---|---|---|
| $S_1$ | 1 | 2 | 1 | 4 | 30 |
| $S_2$ | 3 | 3 | 2 | 1 | 50 |
| $S_3$ | 4 | 2 | 5 | 9 | 20 |
| **Demand** | 20 | 40 | 30 | 10 | |

5. a) Obtain the lines of regression for the following data. Hence find the correlation coefficient between x and y. **8**

| | | | | | |
|---|---|---|---|---|---|
| **x :** | 6 | 2 | 10 | 4 | 8 |
| **y :** | 9 | 11 | 5 | 8 | 7 |

b) The income distribution of workers in a certain factory was found to be normal with mean of Rs. 5000 and standard deviation = Rs. 500. There are 114 persons, getting income above Rs. 6000. Find how many workers are there in the factory. [Given : Area between z = 0 to z = 2 is 0.4772.] **6**

c) 10 coins are tossed simultaneously. Find the probability that i) 6 heads appear, ii) atleast 3 heads appear. **4**

OR

6. a) If the two lines of regression are $3x - 5y + \lambda = 0$ and $15x - 16y + \mu = 0$, $\bar{x} = -3$, $\bar{y} = 5$, find the values of $\lambda$, $\mu$, and the coefficient of correlation between x and y. **6**

b) The accidents per shift in a factory are given by the table :

| **Accidents x per shift** | 0 | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|---|
| **Frequency f** | 142 | 158 | 67 | 27 | 5 | 1 |

Fit a Poisson distribution to the above table and calculate the theoretical frequencies. **6**

c) The table below gives the number of books issued from a certain library on the various days of a week. **6**

| **Days** | Mon. | Tues. | Wed. | Thurs. | Fri. | Sat. |
|---|---|---|---|---|---|---|
| **No. of books issued** | 120 | 130 | 110 | 115 | 135 | 110 |

Test at 5 % *l*.o.s. where the issuing of books is independent of day. $[X^2_5 ; 0.05 = 11.07]$.

## SECTION – II

7. a) With usual notations establish the following : **9**

i) $\frac{\Delta}{\nabla} - \frac{\nabla}{\Delta} = \Delta + \nabla$

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

iii) $1 - e^{-hD} = \nabla$

b) Evaluate numerically $\int_0^1 \frac{1}{1+x^2} dx$ taking $h = \frac{1}{6}$ by using **8**

i) Simpson's $\frac{1}{3}$ rule

ii) Simpson's $\frac{3}{8}$ rule

Hence obtain the approximate value of $\pi$ in each case. Compare the results with true value.

OR

8. a) For the following tabulated data. **9**

| **x** | 0 | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|---|
| **y** | 1.12 | 3.45 | 6.67 | 10.8 | 16.12 | 24.52 |

find y at x = 0.5, $\frac{dy}{dx}$ at x = 5.5.

b) For the following tabulated data. **8**

| θ | 0° | 5° | 10° | 15° | 20° | 25° | 30° |
|---|---|---|---|---|---|---|---|
| tan θ | 0.0000 | 0.0875 | 0.1763 | 0.2679 | 0.3640 | 0.4663 | 0.5774 |

Find the value of tan 16° using stirling's formula.

9. a) Find a real root of the equation 3x = cosx + 1 that lies between 0 and 1 (radians), correct upto four decimal places by using the method of successive approximations. **8**

b) Solve the following system of equations by Gauss elimination method **8**

$10x_1 - 7x_2 + 3x_3 + 5x_4 = 6$

$-6x_1 + 8x_2 - x_3 - 4x_4 = 5$

$3x_1 + x_2 + 4x_3 + 11x_4 = 2$

$5x_1 - 9x_2 - 2x_3 + 4x_4 = 7$

OR

10. a) Solve the following system of equations by Gauss - Seidel iterative method **8**

$20x_1 + x_2 - 2x_3 = 17$

$3x_1 + 20x_2 - x_3 = -18$

$2x_1 - 3x_2 + 20x_3 = 25$

b) Use method of least squares to fit a second degree parabola of the form y = ax2 + bx + c to satisfy following data. **8**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **x** | 1.0 | 1.5 | 2.0 | 2.5 | 3.0 | 3.5 | 4.0 |
| **y** | 1.1 | 1.3 | 1.6 | 2.0 | 2.7 | 3.4 | 4.1 |

11. a) Solve the Laplace equation $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$ at the pivotal points of the grid shown in the Fig. 11a. **9**

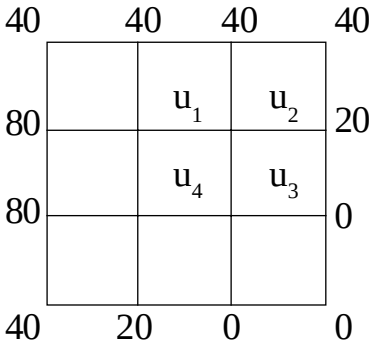


Fig. 11a

b) Using modified Euler's method solve the equation $\frac{dy}{dx} = 1 + xy$ ; y(0) = 1 to find y at x = 0.2 taking h = 0.1. **8**

OR

12. a) Solve the equation $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = -x^2y^2$ over the square with sides x = 0 = y, x = 3 = y with u = 0 on the boundary and mesh length = 1. **9**

b) Use Runge - Kutta method of fourth order to solve $\frac{dy}{dx} + \frac{y}{x} = \frac{1}{x^2}$ ; y(1) = 1 to find y at x = 1.2 taking h = 0.1. **8**

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**[3863] – 124**

# T.E. (Petrochemical) (Semester – I) (2003 Course) Examination, 2010
# CHEMICAL ENGINEERING THERMODYNAMICS

Time : 3 Hours Max. Marks : 100

***Instructions*** *:1) Attempt* ***any three*** *questions from* ***each*** *Section.*
*2) Answers to the* ***two*** *Sections should be written in two* ***separate*** *answer books.*
*3) Figures to the* ***right*** *indicate* ***full*** *marks.*
*4) Assume suitable data* ***wherever*** *necessary.*
*5)* ***Use*** *of steam tables and electronic calculator is* ***allowed****.*

SECTION – I

1. a) Discuss Redlich Kwong and Peng Robinson equations of state in context of hydrocarbon mixtures. **8**

   b) Calculate the mass density of and hence the volume occupied by 500 Kg of methanol vapor at 300 K and 11 bar using ideal gas law and the van der Waals equation. Tc and Pc for methanol are 512.6 K and 81 bar respectively. Comment on your results. **10**

2. a) State first law of thermodynamics as applied to closed and open systems. Explain the terms involved. **6**

   b) Iron reacts with aqueous HCl at 300 K to give aqueous FeC12 and hydrogen. gas. Determine the work done when 1 kg of iron reacts with HCl in a (a) closed vessel and (b) an open vessel. **10**

3. Derive Maxwell relations from the first principles. Using an appropriate Maxwell relation, derive thermodynamic relationship for effect of temperature and pressure on enthalpy of a real gas. **16**

4. Write notes :

   a) Joule Thomson Effect. **6**

   b) Carnot Cycle. **6**

   c) Entropy change in spontaneous processes. **4**

**P.T.O.**

SECTION – II

5. a) Discuss how fugacity is related to pressure and temperature for a real gas. **6**

   b) Estimate fugacity of gaseous propane at 12 bar and 310 K using the following data : **12**

| **P bar** | 1.7 | 3.4 | 6.8 | 10.2 | 11.7 | 13.6 |
|---|---|---|---|---|---|---|
| **V m3/kg** | 0.3313 | 0.1609 | 0.0754 | 0.0468 | 0.0382 | 0.021 |

6. a) What is a partial molar property ? **4**

   b) Derive Gibbs-Duhem equation in its different forms. **12**

7. a) State the equilibrium law applicable to VLE between nonideal solution and nonideal vapor. Explain the terms involved. **6**

   b) Define minimum and maximum boiling azeotropes. **4**

   c) Discuss any two models of activity coefficients. **6**

8. a) Discuss the criterion for chemical reaction equilibrium. State how equilibrium constant can be calculated from basic thermodynamic data. **6**

   b) Equilibrium constant for the ammonia formation reaction N2 + 3 H2 ---$\rightarrow$2 NH3 is given as 0.0002 at 675 K. For stoichiometric feed and 15 bar pressure, calculate equilibrium conversion of N2 and composition of equilibrium mixture on mol% basis. **10**

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# [3863] – 125

## T.E. (Petrochemical Engineering) (Semester-I) Examination, 2010
## PROCESS AND ANALYSIS INSTRUMENTATION
## (2003 Course) (Old Syllabus)

Time : 3 Hours Max. Marks : 100

***Instructions*** *: 1) Attempt Q**1A** or **B**, Q**2A** or **B**, Q**3A** or **B**, Q**4A** or **B**, Q**5A** or **B**, Q**6A** or **B.***

*2) Figures to the **right** indicate **full** marks.*

*3) Use of electronic calculators, steam table is **allowed.***

*4) Draw neat sketch **whereever** necessary.*

SECTION – I

1. A. a) Explain the various process lags with example. **6**

b) Explain the importance of the valve positioner in control valves. **6**

c) Explain the various components of SCADA. **6**

OR

B. a) Explain the various sealing techniques in pressure gauges. **6**

b) What are the factors to be considered while selecting a control valve? **6**

c) Explain servo and regulator control. **6**

2. A. a) Explain the types of measurement uncertainties in detail. **8**

b) Define : Accuracy, Precision, Repeatability, Reproducibility, Hysterisis, Drift, Fidelity, Dead zone. **8**

OR

B. a) Give the classification of the measuring instruments. **8**

b) What is Strouhal number? Describe a flow meter using the same. **8**

3. A. a) Write a note on the Resistance Temperature Detectors (RTD). **8**

b) Explain pressure measurement using enlarged leg manometer. **8**

OR

**P.T.O.**

B. a) Explain the various hydrostatic pressure methods for level measurement. **8**

b) A venturimeter with throat diameter 0.065m and coefficient of discharge 0.95 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 50 mm. The pitot static tube is placed at the downstream 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 100 $kg/m^3$. **8**

SECTION – II

4. A. a) Explain the magnetic susceptibility method for oxygen analysis. **6**

b) Describe UV spectroscopy. **6**

c) Discuss Orsat analysis. **6**

OR

B. a) Explain composition analysis using refractive index method. **6**

b) Describe in brief viscosity measurement. **6**

c) Discuss the various methods of density measurement. **6**

5. A. a) Describe the various sampling techniques. **8**

b) Write a note on Gas Chromatography. **8**

OR

B. a) Classify analysis instruments. **8**

b) Write a note on X ray diffraction method used for composition analysis. **8**

6. A. a) Zirconia cells are now frequently used as oxygen analysis cells, specially in power plants. Describe this method of analysis. **8**

b) Explain the method of analysis using thermal conductivity. **8**

OR

B. a) Discuss total hydrocarbon analysis. **8**

b) Write a note on the mass spectrometer. **8**

**[3863] – 126**

**T.E. (Petrochemical Engineering) (Semester – II) Examination, 2010**
**UNIT PROCESSES IN ORGANICS SYNTHESIS**
**(2003 Course)**

Time: 3 Hours Max. Marks: 100

***Instructions** : 1) Answer **any three** quetions 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 process for conversion of nitrobenzene to aniline by catalytic vapour phase reduction. **12**

   b) Describe the process for conversion of cyclohexane to chlorocyclohexane by photochlorination. **6**

2. a) Describe with flowsheet the process for conversion of ethyl benzene to styrene. **10**

   b) Write a note on Schmidt nitrator. **6**

3. a) Describe with flowsheet any one process to manufacture vinyl chloride monomer. **10**

   b) Write a note on Bechamp reduction. **6**

4. a) Describe with flowsheet the process for manufacture of ethanol by fermentation. **10**

   b) Explain DVS with significance. **4**

   c) Write mechanism for aromatic bromination of benzaldehyde. **2**

**P.T.O.**

SECTION – II

5. a) Describe with flowsheet the process for conversion of acetaldehyde to acetic acid. **10**

   b) Describe the process for preparation of 1, 2-dichloroethane from ethene and chlorine. **8**

6. a) Describe with flowsheet the process for manufacture of dodecyl benzene from benzene. **10**

   b) Mention the types of oxidative reactions with examples. **6**

7. a) Describe the process for conversion of benzene to nitrobenzene. **8**

   b) Write a note on reagents used for alkylation. **4**

   c) Explain desulfonation reaction with significance. **4**

8. a) Describe the continuous process for conversion of chlorobenzene to aniline. **8**

   b) Write notes on : **8**

      i) Friedel Crafts alkylation and acylation.

      ii) Hydrogenation catalysts.

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**[3863] – 127**

# T.E. (Petrochemical) (Semester – II) Examination, 2010
# MASS TRANSFER OPERATIONS
## (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. Attempt the following : **18**

i) Write a brief note on: Choice of Solvent for Liquid-Liquid Extraction.

ii) Write a brief note on: "Optimum reflux ratio for distillation".

iii) Explain Mier's theory for supersaturation for crystallization.

iv) Discuss the five possible feed conditions in distillation operations.

OR

2. a) Carbon disulphide is to be absorbed from a dilute gas mixture of $CS_2$–$N_2$ into a pure non-volatile oil at atm. Pressure in a counter-current absorber. The mole fraction of $CS_2$ in inlet gas stream is 0.05 and the flow rate of gas stream, G is 1500 k mole/hr. the equilibrium relation is given by :

$$y = 0.5x$$

Where x = mole fraction of $CS_2$ in liquid stream. It is desired to reduce the mole fraction of $CS_2$ in the exit gas stream to 0.005.

a) Calculate the minimum value of $\frac{L}{G}$ where L is the liquid flow rate in k mole/hr.

b) Derive the equation for the operating line if $\frac{L}{G}$ is equal to 1.5 times the minimum value. **18**

**P.T.O.**

3. a) Derive the Fenske equation for distillation. State the assumption made, if any. **6**

   b) A liquid feed consisting of 1200 g moles of mixture containing 30% naphthalene and 70% dipropylene glycol is differentially distilled at 100 mm Hg pressure and final distillate contains 55% of the feed solution. The VLE data are-

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **x** | 8.4 | 11.6 | 28.0 | 50.6 | 68.7 | 80.6 | 88 |
| **y** | 22.3 | 41.1 | 62.9 | 74.8 | 80.2 | 84.4 | 88 |

   Determine the amount of distillate determine the concentration of naphthalene in residue and distillate. **10**

OR

4. An equimolar mixture of benzene and toluene is subjected to flash distillation at a pressure of 1 bar in the separator. Determine the compositions (in mole fraction benzene) of the liquid and vapour leaving the separator when the feed is 25% vaporized. Estimate the temperature in the separator.

   Equilibrium data for benzene-toluene system at 1 bar is given in table given below.

| **Temperature (°C)** | **Mole fraction benzene in liquid** | **Mole fraction benzene in Vapour** |
|---|---|---|
| 80.1 | | 1.000 |
| 85.0 | 0.780 | 0.900 |
| 90.0 | 0.581 | 0.777 |
| 95.0 | 0.411 | 0.632 |
| 100.0 | 0.258 | 0.456 |
| 105.0 | 0.130 | 0.261 |
| 110.6 | 0.000 | 0.000 |

   What are the concentrations in the vapour and liquid, and the separator temperature the feed is :

   1) 0% vaporized  2) 50% vaporized

   3) 75% vaporized  4) 100% vaporized ?

   Plot the operating lines for each of these cases and discuss how the operating lines change as f changes. **16**

5. a) A bubble cap-fractionating column consisting of 10 plates working at an average efficiency of 80% is being used to distill 1000 kg/hr of acqueous methanol at its bubble point entering the tower. The feed, overhead product and bottom product are 50-mole % 90-mole % and 10-mole % methanol (1) respectively. A total condenser is provided. The reflux is sent at this saturation temperature. If the reflux ratio is 1.7 times the minimum, check whether the column available is satisfactory. The VLE data are : **16**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| $x_1$ | 8 | 10 | 20 | 30 | 40 | 50 | 70 | 80 | 95 |
| $y_1$ | 36.5 | 41.8 | 57.9 | 66.5 | 72.9 | 77.9 | 87.0 | 95.8 | 97.9 |

OR

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

i) Vacuum and Steam Distillation ii) Azeotropic and Extractive distillation

iii) Optimum reflux Ratio.

SECTION – II

7. a) 60 tons per day of oil sand (25 mass % oil and 75 mass % sand) is to be extracted with 40 tons per day of naphtha in a continuous counter current extraction battery. The final extract from the battery is to contain 40 mass % oil and 60% mass naphtha, and the underflow from each unit is expected to consist of 35 mass % solution and 65 mass % sand. If the overall efficiency of the battery is 50%. How many stages will be required ? **16**

OR

8. a) 350 kg per hour of halibut liver to be extracted in a counter current cascade with ether to recover oil. The ether which has been partially purified contains 2% oil. The fresh liver contains 20% oil and is to be extracted to composition 1% oil (on solvent free basis). 250 kg of solvent is to be used.

a) What % of oil entering with the liver is recovered in the extract ?

b) How many equilibrium stages are required ?

c) Calculate the mass and the direction of the total and component net flow.

Data : **16**

| **Concentration kg oil/Kg solution** | 0 | 0.1 | 0.2 | 0.3 | 0.4 | 0.5 | 0.6 |
|---|---|---|---|---|---|---|---|
| **Kg solution/kg exhausted liver** | 0.288 | 0.368 | 0.44 | 0.51 | 0.6 | 0.71 | 0.87 |

9. a) Classify the commercial extraction equipments. State working principles of Pulse columns. **10**

   b) Discuss the ternary diagram for liquid-liquid extraction by taking suitable example. **6**

OR

10. a) Give the classifications of crystallizer . Explain the working principles and construction of any one type of crystallizer with neat sketch. **10**

   b) Discuss in brief process principles involved in PSA and TSA. **6**

11. a) The equilibrium adsorption of acetone vapour on activated carbon at 30°C is given by

| **gm absorbed / gm carbon** | 0 | 0.1 | 0.2 | 0.3 | 0.35 |
|---|---|---|---|---|---|
| **partial pressure of acetone, mm Hg** | 0 | 2.0 | 12.0 | 42.0 | 92.0 |

   A liter flask contains air and acetone vapour at 1 atm. and 30°C with partial pressure of acetone 100 mm Hg. Two grams of fresh activated carbon is introduced into the flask, and it is sealed. Compute the final vapour concentration at 30°C and the pressure inside the flask. Neglect the adsorption of air. **10**

   b) A 40 cm high bed of adsorbate, when processing 0.2 $m^3$ per hour of a fluid, gives a 480 second break-through time, with 65% of the bed height fully spent. If more adsorbate were added to the bed so as to give 780 seconds before breakthrough at the same flow rate, how much higher will it be ? **8**

OR

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

   a) Classification of membrane separation processes

   b) Membrane modules for membrane processes

   c) Types of Absorbents.

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**[3863] – 128**

**T.E. (Petrochemical) (Semester – II) Examination, 2010**
**REACTION ENGINEERING – I**
**(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 **two separate** answer books.*
*3) Figures to the **right** indicate **full** marks.*
*4) Assume suitable data, whererever **necessary**.*
*5) **Use** of electronic calculator is **allowed**.*

SECTION – I

1. Pure gaseous A decomposes as $A \rightarrow 2R$ at 50°C. Find a rate equation that satisfactorily represents this decomposition from the following data obtained in a constant volume batch reactor operated isothermally at 50 °C **16**

| **Time, min** | 0 | 2 | 4 | 6 | 8 | 10 | 12 | ∞ |
|---|---|---|---|---|---|---|---|---|
| **$P_A$, mm Hg** | 760 | 600 | 475 | 390 | 320 | 275 | 240 | 150 |

2. a) Write a general material balance equation and derive governing equations for PFR, CSTR and batch reactors by deduction. **12**

   b) Reaction $A \rightarrow R$ ($-r_A = k C_A$) is carried out in a CSTR. Conversion reported is 75%. For the aqueous feed with 10 mol A/lit and flow rate of 1000 mol/min. For the same feed quality and flow rate, calculate the conversion achieved if CSTR volume is doubled. **4**

**P.T.O.**

3. Aqueous decomposition of A is studied in an experimental mixed flow reactor. Results obtained in steady state runs are given below.

| **$C_A$, mol/lit** | | **Holding time** |
|---|---|---|
| **In feed** | **In Effluent** | **Sec** |
| 2.00 | 0.65 | 300 |
| 2.00 | 0.92 | 240 |
| 2.00 | 1.00 | 250 |
| 1.00 | 0.56 | 110 |
| 1.00 | 0.37 | 360 |
| 0.48 | 0.42 | 24 |
| 0.48 | 0.28 | 200 |
| 0.48 | 0.20 | 560 |

Calculate volume of PFR required to process 1000 kmol/s of pure A to 75% conversion level. Feed concentration of A is 0.8 mol/lit. **18**

4. Write Notes :
   a) Integral vs Differential analysis.
   b) Reactor configuration for Autocatalytic Reactions.
   c) Reaction kinetics from pressure vs time data in batch reactor.
   d) Scope of reaction engineering. **16**

SECTION – II

5. At present the elementary liquid phase reaction A+B $\rightarrow$ R + S takes place in a PFR using equimolar mixture of A and B. $\left(C_{A0} = C_{B_0} = 1.5\ \text{mol/L}\right)$ conversion is 90% . If a mixed flow reactor five times as large as PFR is to be connected in series with the present PFR which unit should come first and by what factor could the production of R be increased for the new set up ? **16**

6. For a series reaction system given as

   $A \xrightarrow{k_1} R \xrightarrow{k_2} S \quad k_1 \neq k_2$ derive the expression giving maximum yield of product R and optimum holding time required for achieving it in a CSTR. **16**

7. Explain in adequate details:

   a) Multiplicity of steady states in CSTR.

   b) Design of adiabatically operated PFR. **16**

8. Write notes :

   a) Effect of temperature and pressure on equilibrium conversion.

   b) A scheme for calculating product distribution obtained in a PFR for the case of parallel reactions.

   c) Optimum temperature progression. **18**

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# [3863] – 129

## T.E (Petrochemical) (Old Syllabus) (Semester – II) Examination, 2010
## TRANSPORT PHENOMENA
## (2003 Course)

Time : 3 Hours Max. 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) Differentiate between : Laminar – Turbulent flow, Compressible-Incompressible flow, Viscid-Inviscid flow, Uniform-Nonuniform flow, Steady-Unsteady flow. **8**

   b) Write a short note on Non-Newtonian fluid models. **8**

2. a) Write a short note on flow through pipe problems of flow rate, head loss and pipe diameter calculations. **10**

   b) State Navier-Stokes equation clearly explaining the role of each constituent term. **6**

3. a) Explain different flow regimes within turbulent boundary. **6**

   b) Explain Ludwig Prandtl's contribution to studies in characterization of turbulent flow. **6**

   c) Write short note on Turbulent scales. **6**

4. a) Explain Various Mixing problems in process industry. **6**

   b) A flat – blade turbine agitator with disk having flat four blades is installed in tank. The tank diameter is 1.83 m, the turbine diameter is 0.61 m, the width is 0.122 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 0.15 m, the turbine is operated at 90 rpm and the liquid has a viscosity of 10 cp and a density of 929 kg/m$^3$. Calculate 1) The power required kW of the mixer. 2) The power required per unit volume if the vessel is scaled up to three times the original volume keeping the mass transfer rates identical. **10**

**P.T.O**

SECTION – TWO

5. a) A tank containing 22,679.5 kg material with a specific heat of 2.1 kJ/kg · K is to be heated from 293 K to 398 K. The tank contains a heating coil with a heat transfer surface of 9.29 $m^2$, and the overall heat transfer coefficient from the coil to the tank contents of 850 W/m2 · K. Derive the expression and solve for the time required to heat the tank contents with steam condensing at 433 K. **10**

   b) Derive the expression for heating cooling a batch with an external heat exchanger and an isothermal heating medium. **6**

6. a) Explain the classification of partial differential equations with examples in transport phenomena. **8**

   b) Write a short note on CFD applications in chemical engineering. **8**

7. a) Write a short note on Multiphase flows. **10**

   b) Explain various flow regimes in a horizontal gas-liquid flow through circular pipe. **6**

8. Write a short note on **any three** of the following. **18**

   a) Heat, mass and momentum transfer anologies

   b) Blasius equation

   c) Dimensionless numbers and process design

   d) Mechanisms of mixing

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**[3863] – 13**

# T.E. (Mechanical) (Sem. – I) Examination, 2010
# THEORY OF MACHINES AND MECHANISMS – 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 the following terms :
   i) Crowning of pulley
   ii) Initial tension in belt
   iii) Creep in the belt. **6**

   b) A V-belt of 6.0 $cm^2$ cross-section has a groove angle of 40° and an angle of lap of 150°, $\mu = 0.1$. The mass of belt per meter run is 1.2 kg. The maximum allowable stress in the belt is 850 $N/cm^2$. Calculate the power that can be transmitted at a belt speed of 30 m/s. **10**

OR

2. a) Find expression for the screw efficiency at a square thread. Also determine the condition for maximum efficiency. **6**

   b) Explain the terms : **6**
   i) Friction circle
   ii) Friction couple
   iii) Friction axis

   c) Explain friction in a four-bar mechanism. **4**

**P.T.O.**

UNIT – II

3. a) What is meant by wet clutch and dry clutch ? Where are they used ? **4**

   b) Derive the expression for the torque transmitted for flat callar bearing assuming uniform pressure theory. **4**

   c) A conical clutch has a cone angle of 30°. If the maximum intensity of pressure between the contact surfaces is limited to 70 kPa and the breadth of the conical surface is not to exceed 1/3rd of the mean radius. Find the dimensions of the contact surfaces to transmit 22 kW at 2000 rpm. Assuming uniform wear and take coefficient of friction as 0.15. **8**

OR

4. a) Explain the functions of brake and dynamometer. **4**

   b) Explain self-locking or self energising of brake. **4**

   c) Explain with the help of neat sketch any one type of absorption dynamometer. **8**

UNIT – III

5. The roller following a cam moves with SHM during ascent and with uniformly accelerated and deaccelerated motion during descent. The cam rotates at 370 rpm. Draw the cam profile for the following data :

   Least radius of cam = 60 mm

   Angle of ascent = 54°

   Angle of dwell between

   ascent and descent = 48°

   Angle of descent = 66°

   Life of the follower = 50 mm

   Roller diameter = 30 mm

   Offset of follower axis = 20 mm towards right. Determine the maximum velocity and acceleration of follower during ascent and descent. **18**

OR

6. a) With the help of neat sketches explain the types of cam and followers. **6**

   b) Derive an expression for displacement, velocity and acceleration of a tangent cam with roller follower

   when i) roller is in contact with flank

   ii) roller is in contact with nose. **12**

## SECTION – II

### UNIT – IV

7. a) Define the term 'coefficient of fluctuation of energy' and 'coefficient of fluctuation of speed. **4**

   b) Prove that the maximum fluctuation of energy, $\Delta E = E \times 2Cs$, where E = mean kinetic energy of the flywheel and $C_S$ = coefficient of fluctuation of speed. **6**

   c) The flywheel of a steam engine has a radius of gyration of 1m and mass 250 kg. The starting torque of the steam engine is 1500 N-m and may be assumed constant. Determine :
      i) The angular acceleration of the flywheel
      ii) The kinetic energy of the flywheel after 10 sec. from the start. **6**

OR

8. a) Explain the term height of the governor. Derive an expression for the height in the case of Watt Governor. What are the limitations of Watt Governor ? **6**

   b) Explain the term 'Hunting' in case of governor. **2**

   c) What is stability of governor ? Sketch the controlling force verses radius diagrams for a stable, unstable and isochronous governor. Derive the conditions for stability. **8**

### UNIT – V

9. a) Compare the cycloidal and involute tooth forms. **4**

   b) Two 20° involute spur gears have a module of 10 mm. The addendum is equal to 1 module. The larger gear has 40 teeth while the pinion has 20 teeth. Will the gear interfere with the pinion ? **6**

   c) The number of teeth on each of the two equal spur gears in mesh are 40. The teeth have 20° involute profile and the module is 6 mm. If the arc of contact is 1.75 times the circular pitch, find the addendum. **6**

OR

10. a) Derive the velocity ratio and centre distance of helical gears with the help of sketch. **6**

    b) Discuss various types of forces acting on helical gears and its efficiency. **6**

    c) Two left-handed helical gears connect two shafts 60° apart. The normal module is 6mm. The larger gear has 70 teeth and the velocity ratio is 1/2. The centre distance is 370 mm. Find the helix angles of the two gears. **4**

UNIT – VI

11. a) Derive an expression for the centre distance of a pair of spiral gears. **6**

    b) Define the term worm and worm wheel. **4**

    c) Show that, in a pair of spiral gears connecting inclined shafts, the efficiency is maximum when the spiral angle of the driving wheel is half the sum of the shaft and friction angle. **8**

OR

12. a) Explain briefly the difference between simple compound and epicyclic gear trains. What are the special advantages of epicyclic gear train. **8**

    b) 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 rpm in the anticlockwise direction about the centre of gear A which is fixed, determine the speed of gear B. If the gear A is instead of being fixed, makes 300 rpm in the clockwise direction, what will be the speed of gear B ? Sketch the arrangement. **10**

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# T.E. (Polymer) (Semester – I) Examination, 2010
# MATHEMATICAL METHODS IN POLYMER ENGG.
# (2003 Course)

Time : 3 Hours Max. 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) Find the real root of the equation $x^3 + 2x - 5 = 0$ by applying Newton-Raphson method at the end of fifth iteration. Write the algorithm for above method. **9**

   b) Solve the following system of equations by using Gauss-Seidel iteration method :

   $10\ x_1 + x_2 + x_3 = 12$

   $2x_1 + 10x_2 + x_3 = 13$

   $2x_1 + 2x_2 + 10x_3 = 14$ **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) Solve by Gauss-elimination method, the system of equations

   $6x + 8y - 7z = 8$

   $10x + 5y + 8z = 4$

   $7x - 9y + 7z = 11.$ **8**

**P.T.O.**

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

i) $E = \left( \frac{\delta}{2} + \sqrt{1 + \frac{\delta^2}{4}} \right)^2$

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

iii) $\frac{1}{\nabla} Y_n - \frac{1}{\Delta} Y_0 = Y_0 + Y_1 + Y_2 + ..... + Y_n$. **9**

b) For the tabulated data :

| **x** | 0 | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|---|
| **y** | 1.12 | 3.45 | 6.67 | 10.8 | 16.12 | 24.52 |

Find y at x = 0.5, $\frac{dy}{dx}$ at x = 5.5. **8**

OR

4. a) Evaluate $\int_0^{\pi} \frac{\sin^2\theta}{5 + 4\cos\theta} d\theta$ by Simpson's $\frac{3}{8}$th rule, taking $h = \frac{\pi}{6}$. **8**

b) Fit a parabola of the form $y = ax^2 + bx + c$ to the following data : **9**

| **x** | 0 | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|---|
| **y** | –3 | 0 | 5 | 12 | 21 | 32 | 45 |

5. a) Solve by Runge-Kutta method the equation $\frac{dy}{dx} = \frac{y - x}{y + x}$ subject to y(0) = 1, to find y at x = 0.2 taking h = 0.2. **8**

b) Solve the equation $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = -100,$ at the pivotal points of a square plate bounded by the lines x = 0, y = 0, x = 3, y = 3 and h = k = 1 along x and y directions. u = 0 at every point of the boundary of square plate. **8**

OR

6. a) Use Modified Euler's method to solve :

$\frac{dy}{dx} = x - y^2,$ y(0) = 1 to calculate y at x = 0.2 and x = 0.4 taking h = 0.2. **8**

b) Calculate a finite difference solution of the equation

$\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2} (0 \le x \le 1)$ subject to the conditions

$u = \sin \pi x$ when t = 0 for $0 \le x \le 1$

u = 0 at x = 0 and x = 1 for t > 0.

Take $\delta x = 0.1, \delta t = 0.001$. Find u at t = 0.003 by using explicit finite difference scheme. **8**

SECTION – II

7. a) Calculate the Arithmetic mean, standard deviation and coefficient of variation, for the following frequency distribution. **8**

| **Wages in Rupees earned per day** | 0-10 | 10-20 | 20-30 | 30-40 | 40-50 | 50-60 |
|---|---|---|---|---|---|---|
| **No. of labourers** | 5 | 9 | 15 | 12 | 10 | 3 |

b) Calculate the first four moments about the mean of the given distribution. Also find $\beta_1$, $\beta_2$ and excess of Kurtosis. **8**

| **x** | 2.0 | 2.5 | 3.0 | 3.5 | 4.0 | 4.5 | 5.0 |
|---|---|---|---|---|---|---|---|
| **f** | 4 | 36 | 60 | 90 | 70 | 40 | 10 |

OR

8. a) Following are the values of import of raw material and export of finished product in suitable units.

| **Export** | 10 | 11 | 14 | 14 | 20 | 22 | 16 | 12 | 15 | 13 |
|---|---|---|---|---|---|---|---|---|---|---|
| **Import** | 12 | 14 | 15 | 16 | 21 | 26 | 21 | 15 | 16 | 14 |

Calculate the coefficient of correlation between the import values and export values. **8**

b) Find the probability that a leap year selected at random will have 53 Sundays. **4**

c) There are ten political leaders gathered at a party and two are known to be staunch opponents. In how many ways can they be seated in a row so that these two persons do not sit next to each other. **4**

9. a) An unbiased coin is thrown 10 times. Find the probability of getting exactly 6 Heads, at least 6 Heads. **5**

b) The accidents per shift in a factory are given by the table :

| **Accidents x per shift** | 0 | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|---|
| **Frequency f** | 142 | 158 | 67 | 27 | 5 | 1 |

Fit a Poisson distribution to the above table and calculate theoretical frequencies. **6**

c) For a normal distribution when mean $\bar{x} = 1$, S.D. = 3, find the probabilities for the intervals.

i) $3.43 \leq x \leq 6.19$, ii) $-1.43 \leq x \leq 6.19$

($z_1 = 1.73$, $A_1 = 0.4582$ ; $z_2 = 0.81$, $A_2 = 0.2910$]. **6**

OR

10. a) Among 64 offsprings of a certain cross between guinea pigs 34 were red, 10 were black and 20 were white. According to a genetic model, these numbers should be in the ratio 9:3:4. Are the data consistent with the model at 5% level ?

$\left[ \psi^{2}_{2 0.05} = 5.991 \right]$. **6**

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

$[z_1 = 1.48, A_1 = 0.43; z_2 = 1.23, A_2 = 0.39]$. **6**

c) Find the unique fixed probability vector $\bar{t}$ of the regular stochastic matrix. **5**

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

11. a) Determine whether each of the following quantities is a tensor. If so, state whether it is contravariant or covariant and give its rank :

a) $dx^k$ b) $\dfrac{\partial \phi\left(x^1, .....x^N\right)}{\partial x^k}$ **6**

b) If $A_r^{pq}$ and $B_r^{pq}$ are tensors, prove that their sum and difference are tensors. **5**

c) A covariant tensor has components $x^2y$, $2z - y^2$, $yz$ in rectangular coordinates. Find its covariant components in spherical coordinates. **6**

OR

12. 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) A covariant tensor has components xy, $y^2 - z^2$, $x^2z$ in rectangular coordinates. Find its covariant components in cylindrical coordinates. **6**

c) Determine the metric tensor in :

a) cylindrical coordinates

b) spherical coordinates. **6**

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# [3863] – 134

## T.E. (Polymer Engineering) (Semester – I) Examination, 2010
## CHEMICAL ENGINEERING OPERATIONS
## (2003 Course) (Backlog)

Time : 3 Hours Max. Marks : 100

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

SECTION – I

1. a) Write short note on classification of mass transfer operations. **8**

   b) Starting from the 'Ficks law' of diffusion, derive the expression for molar flux of component 'A' ($N_A$) for steady state equimolar counter diffusion of components 'A' and 'B'. **10**

OR

2. a) Differentiate between molecular diffusion and eddy diffusion. **8**

   b) Ammonia gas is diffusing at a constant rate through a layer of stagnant air 1 mm thick. Conditions are fixed so that the gas contains 50% (by volume) of ammonia at one boundary of stagnant layer. The ammonia diffusing to the other boundary is quickly absorbed and the concentration is negligible at the plane. The temperature is 295K and the pressure 1 atm. Under these conditions the diffusivity of ammonia in air is 0.18 $cm^2/s$. Calculate the rate of diffusion of ammonia through the layer. **10**

3. a) Define term 'equilibrium' and write shortnote on vapour-liquid equilibrium. **8**

   b) Draw a neat diagram of tray tower and explain the functions of various parts. **8**

OR

**P.T.O.**

4. Explain the following terms in detail :
   1) Reflux ratio
   2) Simple distillation
   3) Relative volatility
   4) Operating line. **16**

5. a) Define the following terms :
      1) Absolute humidity
      2) Percent relative humidity
      3) Moisture content on wet basis
      4) Un bound moisture. **8**

   b) Write classification of the different types of dryer and explain any one of them in detail. **8**

OR

6. a) Write short note on diffusion through polymers. **8**

   b) Discuss the principle, process and equipment for 'Reverse Osmosis' operation. **8**

SECTION – II

7. a) Write short note on 'rate of mixing'. **8**

   b) Describe various mixing indices used to describe the state of admixture. **8**

OR

8. a) Explain the concept "scale of scruting and scale of examination" for describing state of admixture. **8**

   b) Discuss the Danckwarts concept of scale of segregation and intensity of segregation. **8**

9. a) Discuss the constructional features and mixing action in Maddock mixing section and Egan mixing section. **6**

   b) Write a short note on Ribbon blenders and paddle mixers. **6**

   c) Explain the desired characteristics of distributive and dispersive mixing sections in single screw extruder. **6**

OR

10. a) Write a short note on 'Two Roll Mill'. **8**

    b) Discuss the construction and mixing action of double arm mixture. **4**

    c) Explain with neat sketches constructional features and mixing action of double block head mixing section and blister ring. **6**

11. a) Sketch and explain flow diagram for rubber compounding. **8**

    b) Write a note on various additives used in dry blending of poly vinyl chloride. **8**

OR

12. a) Write a short note on constructional features and mixing action in ko-kneaders. **8**

    b) Sketch and explain flow diagram for calendaring plant for poly vinyl chloride. **8**

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# T.E. (Polymer) (Semester – I) Examination, 2010
# DESIGN OF EQUIPMENT AND MACHINE ELEMENTS
# (2003 Course)

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** diagram must be drawn **wherever** necessary.*
*4) Figure to **right** indicate **full** marks.*
*5) **Use** of logarithmic table, slide rule, Mollier charts, electronic pocket calculator and steam table is **allowed**.*
*6) Assume suitable data **if necessary**.*

SECTION – I

1. A) Discuss any two theories at failure for biaxial stress system. **6**

   B) Explain types of machine design methods with suitable examples. **4**

   C) A cylindrical steel shaft is subjected to a bending movement of 25 KN-m and torsional moment of 45 KN-m. Find diameter of shaft using maximum strain energy theory. If yield strength of steel is 7000 MPa, modulus of steel = 210 GPa and Poisson's ration is 0.25. Assume factor of safety is two. **8**

OR

2. A) Draw a Mohr's circle and show the principal stresses for following stress condition $\sigma_x$ = – 100 MPa $\sigma_y$ = – 20 MPa and $\sigma_{xy}$ = 60 MPa. **8**

   B) Explain stress concentration and any four methods to reduce it. **6**

   C) Write down chemical composition of BIS designation for any **two** of following type of steel : **4**
   i) X10 Cr 18 Ni9
   ii) XT 75 W 18 Cr 4V1
   iii) 40 C5.

**P.T.O.**

3. A) Describe different type of keys with their standard proportions. **4**

   B) Derive an expression for a solid shaft subjected to combine bending and twisting moment. **6**

   C) A steel shaft is required to transmit 125 KW at 320 RPM. The supported length of shaft is 3 meter. It carries two pulleys each weight 1200 N. Supported at a distance of 1 meter from end respectively. Taking allowable stress as 60 $N/mm^2$ determine shaft diameter. **6**

OR

4. A) Explain open and cross belt drive system with suitable example. **4**

   B) Design a bush pin type flexible coupling to connect a pump shaft to motor shaft transmitting 30 KW at 960 rpm. The overall torque is 20% more than mean torque. The material properties are as follows :

   a) Allowable shear and crushing stress for shaft and key material is 40 MPa and 80 MPa respectivaly.

   b) Allowable shear stress for cast iron is 15 MPa.

   c) Allowable beaming pressure for rubber bush is 0.8 $N/mm^2$.

   d) The material of pin is same as shaft and key. **12**

5. A) With reference to hydrodynamic journal beaming explain following terms : **6**

   i) Eccentricity ratio

   ii) Dimentral clearance

   iii) Eccentricity.

   B) List different types of Gear used in power transmission and explain any one gear with neat sketch. **6**

   C) Explain with neat sketch different types of rolling contact bearing. **4**

OR

6. A) Explain any two methods to obtain multiple output speeds of shaft with neat sketch. **8**

   B) A machine spindle is to operate on ferrous metal at 40 m/min. and is required to have 6 speeds. The spindle can accommodate cutter ranging from 10 to 60 rpm diameter.

   Determine the spindle speed. **8**

SECTION – II

7. A) Explain the basic concept of following operation :
   a) Clampforce/Tonnage development
   b) Decompression of Tonnage
   c) Mold open and mold close
   d) Mold safety

   Also with hydraulic circuit explain how these operation take place in conventional direct hydraulic locking machine. **14**

   B) Explain why injection unit need to be held in forward condition with control force during Injection operation. **2**

OR

8. A) With neat sketch, explain any one type of lock and block clamping system. **4**

   B) With neat sketch hydraulic circuit, explain how velocity/fill phase and pressure/hold on phase is achieved in conventional hydraulic system. **8**

   C) Explain how clamp force is generated in toggle system. Give stepwise procedure for setting clamp force in toggle machine. **4**

9. A) Draw neat sketch of sequence valve and explain its function. **6**

   B) Draw neat sketch of fourway, three position direction control valve. Explain the working of direction control valve with all position. **6**

   C) Explain with neat sketch principle of balance vane hydromotor. **6**

OR

10. A) Answer **any three** : **18**

i) With neat circuit diagram, explain break circuit.

ii) Explain hydraulic circuit for rotary motion with speed control with neat sketch.

iii) Explain with neat sketch Transverse and feed circuit.

iv) Explain principle and working of gear pump with neat sketch.

11. A) Explain in brief the design of pressure vessel with half coil jacket construction used for heating. **6**

B) Write a short note on types of joints used in pressure vessel. **6**

C) List the different type of support used in pressure vessel, explain any one support with neat sketch. **4**

OR

12. A) Estimate the thickness of conical head with an apex angle of 38°. The diameter of vessel is 1.5 m. Permissible stress in material is 1200 kg/cm$^2$. Consider welded joint efficiency to be 85%. **4**

B) A hemispherical head with 750 mm diameter is subject to internal pressure of 250 Kg/cm$^2$. Calculate the required thickness of head. Consider permissible stress of material 1000 Kg/cm$^2$ and welded joint efficiency to be 100%. **4**

C) A cylindrical vessel has inside diameter of 25 cm and outside diameter of 37.5 cm. The maximum allowable tensile stress is 1400 Kg/cm$^2$. Calculate the maximum internal pressure that the vessel can sustain. **4**

D) Write short note on "Corrosion allowance" with reference to pressure vessel. **4**

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# [3863] – 136

## T.E. (Polymer Engineering) (Semester – II) Examination, 2010
## POLYMER CHEMISTRY – II
## (2003 Course)

Time : 3 Hours 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) Explain how polydispersity affects the polymer dissolution process. **8**

   b) Explain the polymer dissolution process with reference to enthalpy and entropy change. **9**

OR

1. a) Differentiate chain-end and random degradation with suitable examples. **8**

   b) What is the effect of crystallinity on polymer dissolution? Explain with actual examples. **9**

2. a) Discuss coordination polymerization in detail. **8**

   b) Explain ditacticity in polymers with suitable illustrations. **9**

OR

2. a) Compare ZN polymerization over usual polymerization. **8**

   b) Write a note on metallocene catalyst. **9**

3. a) Define copolymerization. Explain synthesis of graft copolymers. **8**

   b) Write a note on sequence length distribution. **8**

OR

3. a) Discuss the importance of copolymerization. Explain how you will prepare block copolymers. **8**

   b) Give examples of commercial copolymers based on any two polymers. **8**

**P.T.O.**

SECTION – II

4. a) Enlist the properties of phenolic resin and explain how it contributes to the applications of the same. **9**

   b) Give the synthesis of silicone resin. **8**

OR

4. a) Give the commercial formulation for unsaturated polyester resin. **9**

   b) Give the synthesis and curing of epoxy resin. **8**

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

   i) Hydrogenation **6**

   ii) Addition reaction **6**

   iii) Acidolysis **5**

OR

5. a) Explain in detail the following reactions and their commercial use.

   i) Hydroxyl group reactions **6**

   ii) Aminolysis **6**

   iii) Reaction involving ketone **5**

6. a) Derive the kinetic expression for living polymerization. **8**

   b) Explain the kinetics of free radical 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. (Polymer Engg.) (Semester – II) Examination, 2010
## POLYMER MATERIALS – 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) 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) How epoxide resins are characterised ? Enumerate. **5**
   b) Give compounding of phenolic resins. **5**
   c) What are different curing systems used for the crosslinking of unsaturated polyester resins. **6**

OR

2. a) What are vinyl ester resins ? What advantages they have over unsaturated polyester resins ? Give their applications. **6**
   b) Give curing of phenolic resins. **5**
   c) Give formulation for urea formal dehyde resins. **5**

3. a) What are furan resins ? How are they cured ? Give two outstanding properties of furan resins. **6**
   b) Enlist different types of Allyl resins and give their applications. **5**
   c) Write a short note on polybismalleimide resins. **5**

OR

**P.T.O.**

4. a) How silicone resins are prepared ? Give two important properties and two applications of silicone resins. **6**

   b) Compare rigid and flexible P.U. foams. How are they prepared ? **5**

   c) Write a short note on polyimide resins. **5**

5. a) Enumerate four different types of adhesives, explain any one of them in detail. **6**

   b) Explain the role of following ingredients with respect to adhesives

      i) Primer

      ii) Solvent

      iii) Plasticizer

      iv) Thickening agent. **6**

   c) Suggest suitable adhesives for bonding. **6**

      i) Metal to metal

      ii) Rubber

      iii) Glass and ceramics

      Justify your answer.

      OR

6. a) What is a paint ? How it is manufactured ? What are different ingredients used in a paint. Explain their role in paint formulation. **8**

   b) Explain the terms :

      i) Varnish

      ii) Lacquer

      iii) Stains

      where they are used. **5**

   c) What are the properties of paints used in automotive (cars) applications ? **5**

SECTION – II

7. a) Give molecular requirements for a polymer to function as rubber. **6**

   b) Give the outline of latex rubber technology. **6**

   c) Explain in brief the following in context of rubber technology.

      i) Mastication

      ii) Vulcanisation. **6**

OR

8. a) Give the outline of raw rubber technology, explaining various stages involved. **6**

   b) Explain compounding of rubbers. **6**

   c) Explain the process for manufacture of pale crepe rubber. **6**

9. a) What are different types of vulcanising systems used for rubbers ? Explain the role of accelarators and activators in curing of rubbers. **6**

   b) Write short notes on :

      i) Fillers and reinforcements for rubbers

      ii) Peptizers

      iii) Processing aids for rubbers. **10**

OR

10. a) What are nonsulfur vulcanizing systems ? Explain with suitable examples. **6**

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

       i) Antioxidants and antiozonants

       ii) Plasticizers

       iii) Tackifiers.

11. a) Write short notes on : **10**
    i) Thermoplastic elastomers
    ii) Polysulphide rubbers.
    b) State the rubbers used in following applications with reasons : **6**
    i) Truck tyres
    ii) Oil seals
    iii) Conveyer belts.

OR

12. a) Write short notes on : **10**
    i) Neoprene rubber
    ii) EPDM rubber.
    b) State the rubbers used in following applications : **6**
    i) LPG hose
    ii) Car tyres
    iii) Electrical cable insulation

    with reasons.

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**[3863] – 138**

# T.E. (Polymer) (Semester – II) Examination, 2010
# INSTRUMENTATION AND PROCESS CONTROL
# (2003 Course)

Time : 3 Hours Max. Marks : 100

***Instructions*** *:1) Answers to the **two** Sections should be written in **separate** answer 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) Discuss different dynamic characteristics of measuring instrument and also discuss the importance of the same. **8**

   b) Define the following terms and give suitable examples : **8**

      i) Indirect measurement

      ii) Primary element

      iii) Functioning element

      iv) Sensitivity.

OR

2. a) Define term ‘Measuring Instruments’ and write short note on ‘classification of instruments’. **8**

   b) An instrument is specified as having range of 0-500 bar and an accuracy of +/– 0.5 bar and sensitivity of 0.3 divisions/bar and resolution of 0.1% full scale deflection. Find range, sensitivity, and accuracy. **8**

3. a) Describe the thermocouple table and give its utility. **8**

**P.T.O.**

b) List various temperature measuring instruments and describe any one in detail. **10**

OR

4. a) List various pressure measurement instruments and describe any one in brief. **10**

b) Define Gauge Factor and what is change in resistance of stain gauge with resistance of 100 Ω and gauge factors of 2.1, if the gauge is subjected to strain of 0.01. **8**

5. a) Explain with neat sketch the principle, construction, working of differential pressure flow meter. **10**

b) Explain in detail capacitance liquid level indicator system. **6**

OR

6. a) With a neat sketch explain construction, working, advantages and disadvantages of variable Area Flow meter. **10**

b) Explain the construction and working of float type level indicator. **6**

SECTION – II

7. a) Discuss the Transient Response of First Order system for impulse Forcing function. **10**

b) Discuss the objectives of process control. Differentiate between Manual Vs Automatic control operations. **8**

OR

8. a) Discuss the Transfer function of first order system with one example. **8**

b) Explain interacting and non-interacting in system and derive the transfer function for non-interacting system. **10**

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) Write a note on Programmable Logic control. **8**

b) Discuss any one example of PC based control system. **8**

OR

12. a) Write a note on Digital control, Cascade control. **8**

b) Discuss the following control action : **8**

Proportional Action, Integral Action, Derivative Action.

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# T.E. (Polymer) (Semester - II) Examination, 2010
# POLYMER THERMODYNAMICS AND REACTION ENGINEERING
# (2003 Course)

Time : 3 Hours Max. Marks : 100

***Instructions*** *:1) Answer* ***any three*** *questions for* ***each*** *Section.*
*2) Answer to the* ***two*** *Sections should be written in* ***separate*** *books.*
*3)* ***Neat*** *diagram must be drawn* ***wherever*** *necessary.*
*4) Figures to* ***right*** *indicate* ***full*** *marks.*
*5) Assume suitable data,* ***if necessary.***
*6) Use of logarithmic table, slide rules, Mollier chart, electronic pocket calculater & steam table is* ***allowed****.*

SECTION – I

1. A) Derive mathematical statement of first law of thermodynamic for flow process and further show that **10**

$\Delta H = Q - W_s$
Where Q - Heat , $W_s$ - Work done

B) A steam turbine using steam at B68 kPa and 645K and discharging saturated steam at 137kPa is used to generate power for certain chemical plant. The turbine acts, adibatically feed and discharge velocity may be considered equal. Determine theoretical horse power developed by turbine if it uses 1650 kg steam per hours from steam table enthalpy of super heated steam at 1368 kPa and 645K is 3200 KJ/ Kg & enthalpy of saturated steam at 137 kPa is 2690 KJ/kg. **6**

OR

2. A) Derive the Maxwell equation. **8**
B) An electric current 0.5A from a 12Volt supply is passed for 5 minutes through resistance in thermal contact with saturated water 1atm. As a result 0.7989gram of water is vaporised. Assuming water vapour behave ideally. Calculate the molar internal energy change and enthalpy change during process. **6**
C) Define internal energy. State significances of internal energy. **2**

3. A) Explain in brief about chemical potential and partial molar properties. Explain any one method to measure partial molar properties. **8**

   B) Explain fugacity model. How to evaluate fugacity using free volume equation of state and compressibility chart or 'z' factor ? **8**

OR

4. A) Derive equation & show that **4**

$$\Delta S_{mix} = -R \sum x_i \ln(x_i)$$

   B) State various statement of second law of thermodynamics & explain importances of entropy in it. **6**

   C) Derive an expression for coefficient of thermal expansion for gas that obey Vanderwall equation of state. **6**

5. A) Explain Flory - Huggins theory in case of polymer solvent system in detail. **9**

   B) Derive Gibb's - Duhem equation & give its use. **9**

OR

6. A) What is solubility parameter ? Explain importances of solubility parameter related to polymer mixing. **4**

   B) How polymer solution differ from other inorganic solution ? Differentiate between regular & irregular solution. **6**

   C) Differentiate between upper critical solution temp (UCST) & lower critical solution temp (LCST) & explain its significances. **8**

SECTION – II

7. A) Derive expression for rate constant of irreversible unimolecular first order reaction and show that half life period of first order reaction is independent of concentration of reactant. **8**

   B) The rate of reaction of concentration 0.15 gram mole/lit & 0.05 gram mole/lit are $2.7\times10^{-3}$ & $0.3\times10^{-3}$ (mole/lit.min). What is order of reaction with respect to reactant ? **4**

   C) In case of first order reaction show that time required for 75% conversion is double the time required for 50% conversion. **6**

OR

8. A) After eight minute in batch reacter, the reactant A[$C_{A_0}$= 1 mole/lit.] is 80% converted after eighteen minute conversion is 90%. Find the rate equation to respresent this reaction. **6**

B) At 25°C the rate constant for hydrolysis of ethyl acetate by sodium hydroxide is 6.5lit/mole per min. Starting with concentration of base and alkali 0.03 mole/lit. of each. what proportion of ester will be hydrolysed in 10 minute ? **6**

C) List the method of interpretation of batch reactor data and explain any one method in detail with example. **6**

9. A) Derive performance equation of plug flow reacter. **8**

B) One lit./min. of liquid containing A & B [$C_{AO}$ = 0.10 mole/lit. $C_{BO}$ = 0.01mole/lit.] flow into mixed reactor of volume one liter. The material react in complex manner for which stiochiometry is unknown. The outlet steam from reactor contain A, B&C [$C_{Af}$ = 0.02 mole./lit.];$C_{Bf}$ = 0.03 mole/lit. $C_{Cf}$ = 0.04 mole/lit]. Find the rate reaction A,B and C for condition within reactor. **8**

OR

10. A) Differentiate between holding time and space time for flow system. **4**

B) Explain in brief space time and space velocity with suitable example. **4**

C) A homogenous gas decomposition of phosphine $4PH_{3(g)} \rightarrow P_{4(g)} + 6H_{2(g)}$ proceed at 1200°F with first order rate — $r_{PH_3} = (10/hr)C_{PH_3}$. What size of PFR operating at 1200° F and 4.6 atm can produce 80%. Conversion of feed consisting of 4 lb-mole. **8**

11. A) Define chemical equilibrium. Explain in detail criteria of chemical equilibrium with example. **8**

B) Explain effect of temperature and pressure on equilibrium constant with neat sketch. **6**

C) Define stiochiometric number. **2**

OR

12. A) Derive relationship between equilibrium constant and standard free energy change. **8**

B) Explain in brief feasibility of a reaction with example. **4**

C) What is extent of reaction and how it related with Gibb's free energy ? **4**

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# T.E. (Comp./IT) (Semester – I) Examination, 2010
# 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 travel agency maintains various taxis. The list of drivers and their licence number is also maintained by them. A log book maintains details about tours that might have taken place along with date, location and drivers name and other details. **6**
   i) Construct E-R model
   ii) Convert E-R into relational model, identify key attributes.
   b) What are the functional components of DBMS ? Explain with neat sketch. **8**
   c) Explain the distinction between condition-defined and user-defined design constraints. Which of these contraints can the system check automatically ? Explain. **4**

OR

2. a) Explain Specilization, generalization and aggregation with example. **6**
   b) Discuss the entity integrity and referential integrity constraits. **8**
   c) Explain different functions of DBA. **4**
3. a) Consider the relational database **8**

   dept(dept_no, name, location)

   employee(emp_no, emp_name, design, dept_no, proj_no)

   project(proj_no, proj_name, status)

   dept and employees are related as one to many.

   project and employees are related as one to many.

**P.T.O.**

Write relational algebraic expressions or SQL query for the following :

i) List all the employees of 'inventory' department of 'Mumbai' location.

ii) Give the names of employees who are working on 'blood bank' project.

iii) Give the names of manager from 'marketing' dept.

iv) Give all the employees working under 'incomplete' projects.

b) Describe the circumstances in which you would choose to use embedded SQL rather than using SQL alone or using only a general purpose programming language ? List various embedded commands. **8**

OR

4. a) Consider the relational database **8**

Supplier(sid, sname, address)

Parts(pid, pname, color)

Catalog(sid, pid, cost)

Write relational algebraic expression or SQL queries for the following :

i) Find names of suppliers who supply some red parts.

ii) Find names of all parts whose cost is more than Rs. 25

iii) Find name of all parts whose color is green.

iv) Find name of supplier and parts with its color and cost.

b) Describe the concept of cursor and how it is used in embedded SQL. Explain various commands in embedded SQL. **8**

5. a) Consider R(A, B, C, D, E) with F defined as $A \rightarrow B, CD \rightarrow E, A \rightarrow C, B \rightarrow D, E \rightarrow A$. Compute the closure of attributes set AD. (Hint : compute AD+). **8**

b) Give an example of relation schema R and a set of dependencies such that R is in BCNF, but not in 4 NF. **8**

OR

6. a) Rewrite the definitions of 4 NF and BCNF using the notions of domain constraints and general constraints. **6**

b) Which are different fact finding techniques ? State advantages and disadvantages of each. **10**

SECTION – II

7. a) What is index ? How it is used to speed up database retrieval ? Explain different types of index. **8**

   b) Explain insertion operation on B+ trees with suitable example. **8**

OR

8. a) Differentiate between static and dynamic hashing. **8**

   b) Discuss the techniques for allowing a hash file to expand and shrink dynamically. What are the advantages and disadvantages of each ? **8**

9. a) What is concurrency control ? Explain timestamp bases protocol. Compare the deferred and immediate versions of the log based cost. **8**

   b) Illustrate difference between conflict serializable schedule and view serializable schedule by an appropriate example. **8**

OR

10. a) Show that two phase locking protocol ensures conflict serializability. **8**

    b) When do deadlocks happen, how to prevent them, how to recover if deadlock takes place ? **8**

11. a) Specify advantages and disadvantages of distributed system. **9**

    b) Discuss how persistence is specified in the ODMG object model in C++ binding. **9**

OR

12. a) Explain in detail ODMG language constructs for object definition and object manipulation. **9**

    b) What is the difference between persistence and transient objects ? How is persistence handled in the typical object oriented database systems ? **9**

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# T.E. (Computer) (Semester – I) Examination, 2010
# DATA COMMUNICATIONS
# (2003 Course)

Time : 3 Hours Max. Marks : 100

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

SECTION – 1

1. a) 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 Transmission efficiency of the AM wave. **4**

   b) Describe with an example the relationship and its significance between FM and PM. **6**

   c) Describe in short what is Quadrature Amplitude Modulation (QAM). What are its advantages ? **6**

OR

2. a) Describe the terms ASK, FSK, PSK. What is the significance of these types of Modulation system ? **6**

   b) Describe in short the TDM and FDM techniques along with their suitable applications. **6**

   c) What is Wide band FM (WBFM) ? What is the bandwidth supported ? **4**

3. 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) Describe NRZ, NRZI, Manchester and Differential Manchester line coding technique with suitable example. **8**

OR

4. a) Explain in detail Delta Modulation. Draw block diagrams of delta modulator and demodulator. What are its advantages over PCM ? **10**

   b) Explain what is sampling theorem and its significance from the signal reconstruction point of view. **2**

   c) 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**

5. a) An analog signal having 8 KHz bandwidth is sampled at 2.5 times the nyquist rate and each sample is quantized into one of the 256 levels. Assuming that successive samples are statistically independent

      i) What will be the information rate of the source ?

      ii) What is the data rate or signaling rate ? **8**

   b) Describe the terms code rate, hamming weight of a code word, code efficiency and hamming distance. **8**

OR

6. a) What is CRC ? Compute the polynomial check sum for a Frame 1101011011 using the generator $G(x) = X^4 + X + 1$. **8**

   b) Explain minimum distance dmin of linear block code. What is its significance in error detection and correction ? **8**

SECTION – 2

7. a) Draw and explain the TCP/IP protocol stack. What is the difference between IP and TCP protocol ? **6**

   b) An organization has decided to design a LAN to support 30 users. Describe the various components required in this design. Also draw the topology of this network. **8**

   c) Differentiate between Frame relay and ATM. **4**

OR

8. a) Describe the various half duplex operational parameters of Ethernet. **8**

   b) Draw and explain in short the Ethernet Frame Structure. **6**

   c) What is SONET ? Where it is used ? What is the data rate supported by STS-1 ? **4**

9. a) Draw and explain the block diagram of T1 carrier system. How many voice channels are supported ? **8**

   b) Differentiate between circuit switching and packet switching (at least 4 points) . **8**

OR

10. a) What is UTP cable and where it is used ? Also comment on the various categories of UTP cable. **8**

    b) Describe the terms refraction and reflection associated with fiber optic cable. **4**

    c) Describe various categories of coaxial cables with their suitable applications. **4**

11. a) What is flow control ? Describe the sliding window flow control technique. **8**

    b) Explain why CSMA/CD protocol can not be used in wireless LAN. What is the alternative solution adapted ? **8**

OR

12. a) What is framing ? What are the various framing techniques ? Which framing technique is widely used ? **8**

    b) Draw and explain the HDLC protocol Frame format. **8**

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## T.E. (Computer Engineering) (Semester – I) Examination, 2010
## 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) Draw and explain the architectural block diagram of Pentium processor. **9**

   b) Explain the branch prediction mechanism of Pentium processor. **9**

   OR

2. a) What are major RISC features of Pentium processor? **6**

   b) Explain the superscalar architecture of Pentium processor. **6**

   c) What are different floating-point data types supported by Pentium FPU? Give formats for any two data types. **6**

3. a) Draw and explain non-pipelined read cycle of Pentium. **8**

   b) Explain following instructions with respect to Pentium instruction set **8**

      i) CALL for near and far procedures

      ii) BOUND

   OR

4. a) With the help of neat block diagram explain the data bus interface with 8 bit, 16 bit and 32 bit memory in Pentium. **8**

   b) Explain different types of JMP instructions executed in Pentium. **8**

5. a) Explain the methods by which task switching can be forced in Pentium. **8**

   b) What is the purpose of control registers in protected mode? Explain use of CR2 and CR3 for paging in Pentium. **8**

OR

6. a) With the help of a neat diagram explain linear to physical address translation. **8**

   b) What is the purpose of Task register? Explain its structure with the help of neat diagram. **8**

## SECTION – II

7. a) What is Multitasking? Explain what registers and descriptors are involved to support this feature in Pentium. **8**

   b) How virtual mode is different than protected mode ? **6**

   c) What do you mean by term fault in Pentium? Explain with examples. **4**

OR

8. a) What is IDT? Explain the various mechanisms to handle interrupts in Pentium. **8**

   b) Explain the significance of I/O permission bit map in Pentium. **6**

   c) Explain Nested task in Pentium. **4**

9. a) Describe Serial port in 8051 along with different modes. **8**

   b) What are different addressing modes in 8051? Explain with suitable example. **8**

OR

10. a) Describe Timer in 8051 along with different modes. **8**

    b) Write assemble language program for 8051 microcontroller to copy five numbers from internal data memory (starting at address 50H) to external data memory (starting at address 5000H). **8**

11. a) Explain architectural features of PIC 16C61/71. **6**

    b) What are the steps required in ADC programming in PIC 16C61/71 ? **6**

    c) Draw and explain Status registers of PIC 16C61/71. **4**

OR

12. a) Describe Power on Reset and Brown out Reset in PIC Microcontroller. **6**

    b) Name different SFRs used for interrupt handling in PIC 16C61/71. **6**

    c) Explain the following instructions:

    i) RETFIE

    ii) BTFSS. **4**

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# T.E. (Computer) (Semester – I) Examination, 2010
# THEORY OF COMPUTATIONS
# (2003 Course)

Time : 3 Hours Max. Marks : 100

***Instructions*** *: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 the set of strings in (0+1)* such that some two 0's are separated by string whose length is 4i, for some i>=0. **6**

   b) For each of the following regular expression, draw an Finite Automata recognizing the corresponding language **8**

      1) (1+10+110)*0

      2) 1(01+10)*+0(11+10)*

      3) (010+00)*(10)

      4) 1(1+10)*+10(0+01)*

   c) Prove : **4**

      a) $\Phi^* = \in$

      b) $\underline{(r^*s^*) = (r+s)^*}$.

OR

2. a) A transition table is given for another NFA with NULL with seven state. **6**

| q | δ(q,a) | δ(q,b) | δ(q,∅) |
|---|---|---|---|
| **1** | {5} | ∅ | {4} |
| **2** | {1} | ∅ | ∅ |
| **3** | ∅ | {2} | ∅ |
| **4** | ∅ | {7} | {3} |
| **5** | ∅ | ∅ | {1} |
| **6** | ∅ | {5} | {4} |
| **7** | {6} | ∅ | ∅ |

a) Draw a transition diagram b) Calculate $\delta^*(1,ba)$.

b) Give the Mealy and Moore machine for the following processes. "For input from (0+1)*, if inputs ends in 101, output X; if input ends in 110, output Y, otherwise output Z". **8**

c) Let L be a language. It is clear from the definition that $L^+ \subseteq L^*$. Under what circumstances are they equal ? **4**

3. a) Show whether the language $L = \{0^n 1^{2n} \mid n>0\}$ is regular or not. **6**

b) Let $L = \{0^n \mid n \text{ is prime}\}$ show that L is not regular. **6**

c) Let L be any subset of 0*. Prove that L* is regular. **4**

OR

4. 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) With suitable example, prove the following theorem : **10**

"The regular sets are closed under union, concatenation, and kleene closure".

5. a) Find the CNF for the following grammar **10**

i) $A \rightarrow B1B1B$
$B \rightarrow 1B \mid 0B \mid \varepsilon$

ii) $S \rightarrow AB0$
$A \rightarrow 001$
$B \rightarrow A2$

b) Eliminate all unit, useless and null productions from the grammar given below : **6**

$S \rightarrow 0X \mid 011$
$X \rightarrow 00X \mid \in$
$Z \rightarrow 1Z \mid 11C$
$C \rightarrow Z$

OR

6. a) Find the GNF for the following Grammar : **10**

i) $A \rightarrow B1B1B$
$B \rightarrow 1B \mid 0B \mid \varepsilon$

ii) $S \rightarrow AA10$
$A \rightarrow SS11$

b) Eliminate all unit, useless and null productions from the grammar given below : **6**

$S \rightarrow XYaC$
$X \rightarrow YC$
$Y \rightarrow b \mid \in$
$C \rightarrow D \mid \in$
$D \rightarrow d$

SECTION – II

7. a) Construct the PDA that recognizes the languages
$L = \{a^i b^j c^k \mid i, j>0 \text{ and } i = j \text{ or } i = k\}$. **8**

b) Give PDA for following Regular Expression : **10**

i) $r = (0+1)^*\ 111\ (0+1)^*$

ii) $r = 0^*\ 11\ (0+1)^*$.

OR

8. a) Give the regular expression and language generated by following grammar **12**

   $A \rightarrow BC$

   $B \rightarrow 0B1 \mid 01$

   $C \rightarrow 2C3 \mid 23$

   Convert the grammar into NPDA.

   b) Show that the language $L = \{0^n1^j \mid n = j^2\}$ is not CFG. **6**

9. Explain the following : **16**

   i) Basic Turing machine

   ii) Different types of Turing machine

   iii) Halting problem of Turing machine

   iv) Difference between Turing machine and finite state machine.

   OR

10. a) Design a turing machine for the following language :
   "the set of all strings with an equal number of 0' sand 1's". **6**

   b) Draw a transition diagram for a turing machine accepting each of the following languages : **10**

   1) $\{a^ib^j / i < j\}$ 2) $\{www / w \in \{a,b\}^*\}$

11. a) Show that the following problem is undecidable : "Given a TM, T is L(T) regular or context free or recursive or none ?" **8**

   b) i) Prove that "The set of real numbers, R, is not countable"

   ii) Show that any subset of a countable set is countable. **8**

   OR

12. a) If L1 and L2 are two recursive languages and if L is defined as : L = {w | w is in L1 and not in L2, or w is in L2 and not in L1}. Prove or disprove that L is recursive. **10**

   b) Show that an infinite recursively enumerable set has an infinite recursive subset. **6**

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# T.E. (Computer) (Sem. II) Examination, 2010
# PRINCIPLES OF PROGRAMMING LANGUAGES
# (2003 Course)

Time : 3 Hours Max. Marks : 100

***Instructions :*** *1) Answer **any three** questions from **each** Section.*
*2) Answers to these Sections should be written in **separate** books.*
*3) Neat diagrams must be drawn **whenever** necessary.*
*4) Figures to the **right** indicate **full** marks.*
*5) Assume suitable data **if necessary**.*
*6) Attempt Q. **1** OR Q. **2**, Q. **3** OR Q. **4**, Q. **5** OR Q. **6** from Section **1**. Attempt Q. **7** OR Q. **8,** Q. **9** OR Q. **10,** Q. **11** OR Q. **12** from Section **2**.*

SECTION – I

1. A) What do you mean by Programming Language, Programming Paradigm and Programming Concept ? With suitable diagram demonstrate the relationship between them. **6**

   B) Explain following properties of Programming Paradigms. **6**
   1) Observable Non-determinism
   2) Named State

   C) Define the following terms : **6**
   1) Record
   2) Lexically Scoped Closure
   3) Component
   4) Module
   5) Data Abstraction
   6) Abstract Data Type

OR

2. A) What do you mean by Independence (Concurrency) ? What are three levels of Concurrency ? Compare Concurrency with Parallelism. **8**

   B) What is significance of Dynamic type Checking ? What are advantages and Disadvantages of Dynamic type Checking ? **6**

   C) What are design issues for Counter Controlled loop statements ? **4**

**P.T.O.**

3. A) What is access function for an array ? How's storing of multidimensional arrays take place ? Develop row major access function for two-dimensional arrays. **8**

   B) When would you use a parameter that is a pointer ? When would you use a parameter that is a reference ? Explain Advantages and Disadvantages of each. **8**

OR

4. A) Explain following terms with suitable examples. **8**
   1) Exception and Exception handler.
   2) Raising an Exception
   3) Build in Exception

   B) With suitable examples, Explain the significance of following terms related to Variable. **8**
   1) Lifetime
   2) Scope
   3) Static Scope
   4) Dynamic Scope

5. A) What are various stages of program execution written in procedural language ? Explain in brief. **6**

   B) Explain Characteristics of Procedural programming paradigm. **6**

   C) Write a short note on Block Oriented structured programming. **4**

OR

6. A) What are Dangling pointers ? Why these pointers are dangerous ? Explain sequence of operations creating Dangling reference. **6**

   B) What is Variant Record ? Explain how Variant records are implemented in C and PASCAL. **6**

   C) Explain various Data types of PASCAL. **4**

SECTION – 2

7. A) With respect to JAVA, What is use of string buffer over string ? **4**

   B) What is use of following JAVA methods ? **4**
   1) indexOf (String S, int i)
   2) toCharArray( )

   C) How to create our own exception handling mechanism in JAVA ? **4**

   D) What do you mean by Garbage Collection ? Why it is important ? **4**

OR

8. A) What are fundamental differences between value types and reference types with respect to C# ? **4**

   B) Specify significant difference between C# constructors and C+ + Constructors. **4**

   C) Explain following Object Oriented concepts of .NET framework Class Object with suitable Examples. **8**
   1) Finalizers
   2) IDisposable
   3) Delegates
   4) Events

9. A) Consider following PROLOG Database : **8**

| | |
|---|---|
| Likes_to_eat (Cat, Fish) | Likes_to_eat (Cat, Mouse) |
| Likes_to_eat (Cat, Butter) | Likes_to_eat (Dog, Roti) |
| Likes_to_eat (Dog, Fish) | Likes_to_eat (Horse, Grass) |
| Likes_to_eat (Cow, Grass) | Likes_to_eat (Cow, Roti) |

   What is the result in each of the following cases ?
   1) Goal : Likes_to_eat (Cow, X) and Likes_to_eat (Dog, X)
   2) Goal : Likes_to_eat (Cow, X) and Likes_to_eat (Y, X)
   3) Specify the Goal to list all animals who Likes_to_eat Roti
   4) Specify the Goal to list other likings of animals who Likes_to_eat Fish

B) With suitable Examples, explain following terminologies in PROLOG
   1) Facts
   2) Rules
   3) Queries
   4) Cuts. **8**

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 short note on Free and Bound identifiers support with respect to Lambda Calculus. **6**

   B) Write a program for following vector operations : **8**
   1) Addition of two Vectors
   2) Multiply Vector by Scalar
   3) Display a Vector

   C) State and explain key features and design goals of LISP. **4**

OR

12. A) Consider List Two Lists : **4**

   X = (a b c d e) Y = Reverse of X

   Write output of following :
   1) (cadddr X)
   2) (nth 2 (cdr X))
   3) (append Y X)
   4) (length (append X (nth 2(cdr X))))

   B) Explain Shallow Binding and Deep Binding with respect to LISP. **6**

   C) Explain Innermost and Outermost expression evaluation techniques with suitable examples. **8**

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# T.E. (Computer) (Semester – II) Examination, 2010
# 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** diagram must be drawn **whenever** necessary.*

*4) Black figures to the **right** indicates **full** marks.*

SECTION – I

1. a) What is the difference between a protocol and a service interface ? **8**

   b) Explain CRC error detection mechanisms with an example. **8**

   OR

2. a) Explain in details the data transmission in OSI reference model. **8**

   b) What are the advantages and limitation of using frame relay over X.25 for communication ? What are the various steps in congestion control handling in frame relay network ? **8**

3. a) Go back N and selective repeat are two approaches to deal with transmission error. With the aid of a packet sequence diagram show the operation of go back n when a data packet ACK/NAK packet is corrupted. **8**

   b) What is framing ? Why framing is necessary ? Explain different framing technique used in data link layer. **8**

   OR

4. a) Explain HDLC in details. **8**

   b) Explain with the help of phase diagram. Working of ppp. List all the activities carried out during each phase. **8**

**P.T.O.**

5. a) Explain CSMA/CD protocol with binary exponential back off algorithm used in internet . **9**

   b) Let G = 0.5 [frames/slot] be the total rate at which frames are transmitted in a slotted ALOHA system. What proportion of slots will be collision free ? What proportion of slots will be collision free when the system is operating at its maximum throughput ? **9**

OR

6. a) Discuss the connection management followed in Bluetooth technology. **9**

   b) Describe the collision avoidance mechanism used in 802.11 wireless LAN. How this mechanism solves the hidden terminal problem ? **9**

SECTION – II

7. a) What is count to infinity problem ? How it can be solved using split horizon algorithm ? What are its limitations ? **8**

   b) Explain different types of headers supported by IPV6. **8**

OR

8. a) Explain the function of Network layer in ATM network. **8**

   b) Explain routing table and routing module. **8**

9. a) Explain the steps involved in computing check sum for an UDP datagram. **8**

   b) Explain four way handshaking method to terminate a connection in TCP. **8**

OR

10. a) What is QOS in internet working ? What are the technique to improve QOS ? **8**

    b) What is silly window syndrome problem ? Suggest two solution to recover this problem. **8**

11. a) How does DNS perform name resolution ? Mention the DNS message format for query and reply messages ? **9**

    b) What are the three main components of internet mail system ? Explain briefly three SMTP command issued by client. **9**

OR

12. a) Explain Virtual private network. What are the applications ? **9**

    b) Explain FTP and TFTP ? **9**

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**[3863] – 150**

# T.E. (Computer Engineering) (Semester – II) Examination, 2010
# SOFTWARE ENGINEERING
# (2003 Course)

Time: 3 Hours Max. Marks: 100

***Instructions :*** *1) Answer the questions -*

*from Section **1** (Q.**1** or Q.**2**) and (Q.**3** or Q. **4**) and (Q. **5** or Q.**6**) and*

*from Section **2** (Q.**7** or Q. **8**) and (Q.**9** or Q.**10**) and (Q.**11** or Q.**12**)*

*2) **Neat** diagrams must be drawn **wherever** necessary.*

SECTION – I

1. a) Explain with neat diagram incremental model and state its advantages and disadvantages. **6**

   b) What is software process and what are the generic framework activities that are present in every software process ? **6**

   c) Write short note on : Unified Process. **5**

   OR

2. a) Why the software maturity framework was developed ? What is CMM ? Explain its level and state any two key process areas of each level. **9**

   b) Explain different types of softwae myths. **8**

3. a) Explain the importance of system modeling. Explain the factors that are considered to create system model. **6**

   b) Write short note on : System modeling using UML. **6**

   c) Explain business process engineering with suitable example. **5**

   OR

4. a) What are the core principles of software engineering practice ? **8**

   b) What are planning practices in software engineering ? Explain their principles. **9**

**P.T.O.**

5. a) Explain the steps required to initiate requirements engineering. **8**

   b) Draw a use case diagram for 'Withdrawal of money from bank' operation. **8**

OR

6. a) What is DFD ? Draw a level 0 and level 1 DFD for Railway Reservation System. **8**

   b) What is Quality Function Deployment ? Explain the requirements identified by QFD. **8**

SECTION – II

7. a) Explain in Domain Analysis, discuss in short: data objects, Cardinality and modality in data models. **9**

   b) Describe and explain the importance of following architecture- **8**

      i) Call-return architecture

      ii) Layered architecture.

OR

8. a) What is the relationship between modularity and functional independence ? Whether high cohesion and low coupling is practically achievable ? Justify your answer. **9**

   b) What is meant by cohesion and coupling criteria's that address the function independence ? List all types of cohesion. **8**

9. a) What categories of errors are traceable using Black-Box testing ? Explain in detail the following Black-Box testing methods **9**

      i) Equivalence partitioning

      ii) Boundary value analysis

      iii) Orthogonal Array testing

   b) What are the unit testing considerations ? What is the difference beween test stub and driver ? What are the problems associated with Top-down integration ? **8**

OR

10. a) Explain in detail basis path testing with following details- **8**
    i) Flow Graph notation
    ii) Cyclomatic complexity

    b) What are objectives of white-box testing ? Explain in detail the following White box testing techniques. **9**
    i) Data Flow Testing
    ii) Branch Testing.

11. a) Explain the difference between Measure and Metric. What are the attributes of effective software metric ? **8**

    b) What are measurement principles ? Explain in detail goal-oriented software measurement. **8**

OR

12. a) What is software quality ? Explain in detail **8**
    i) McCall's Quality factors
    ii) ISO 9126 Quality factors.

    b) List the metrics for analysis and design model. **8**

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# [3863] – 151

## T.E. (Information Technology) (Semester – I) Backlog Examination, 2010
## OPERATING SYSTEMS
## (2003 Course)

Time : 3 Hours Max. Marks : 100

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

SECTION – I

1. a) Describe the services provided by Operating System. **8**

   b) Describe the evolution of Operating Systems with examples. **8**

   OR

2. a) Explain the following terms with examples. **8**
      1) Multiprogramming
      2) Multitasking
      3) Multiprocessing
      4) Time sharing.

   b) Explain modern Unix kernel with a neat diagram. **8**

3. a) What is process image ? Explain with neat diagram contents of a process image. **8**

   b) Explain the UNIX process diagram in detail. **10**

   OR

4. a) Explain the conditions for the occurrence of deadlock. **8**

   b) Explain the Hardware and OS approaches for achieving Mutual Exclusion. **10**

5. a) Explain the RR scheduling algorithm with example. **8**

   b) State four approaches for multiprocessor thread scheduling and processor assignment. **8**

   OR

**P.T.O.**

6. a) List and explain any three classes of real-time scheduling. **6**

   b) Consider the following set of processes, with the length of processes given in milliseconds. Assume time quantum equal to 1. **10**

| Process | Arrival time | Burst Time |
|---|---|---|
| **P1** | 0 | 6 |
| **P2** | 2 | 2 |
| **P3** | 4 | 3 |
| **P4** | 6 | 4 |
| **P5** | 8 | 5 |

   a) Draw Gantt chart illustrating the execution of these processes using Round Robin scheduling.
   b) Calculate waiting time and turnaround time for each process.
   c) Calculate average waiting time and turnaround time for all the processes.

SECTION – II

7. a) A process references pages in the following order **10**

   2 3 2 1 5 2 4 5 3 2 5 2

   Use FIFO and LRU page replacement algorithms to find out the number of page faults for the above reference string using 3 page frames.

   b) Explain the concept of translation Look aside buffer with the help of neat diagram. **8**

OR

8. a) Explain the concept of partitioning. Describe any one scheme memory management using partitioning. **10**

   b) Explain the concept of paging in detail. **8**

9. a) Explain secondary storage management in detail. **8**

   b) Describe three levels of record blocking with the help of neat diagram. **8**

OR

10. Explain with example and neat diagram following disk scheduling algorithms. **16**
    1) SCAN 2) C-SCAN
    3) SSTF 4) FIFO

11. a) Explain shell in detail. State and explain different types of shells. **8**

    b) Write a shell script to find the number palindrome. **4**

    c) Write a shell script to find a factorial of a given number. **4**

OR

12. a) How is security implemented in UNIX ? **8**

    b) Explain the UNIX password scheme with the help of neat diagram. **8**

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**[3863] – 152**

# T.E. (Information Technology) (Semester – I) Examination, 2010
## MULTIMEDIA SYSTEMS
## (2003 Course)

Time: 3 Hours Max. Marks: 100

***Instructions** : 1) Answers to the **two** Sections should be written in **separate** answer books.*

*2) From Section **I** answer Q.**1** or Q.**2**, Q.**3** or Q.**4**, Q.**5** or Q.**6** and from Section **II** answer Q.**7** or Q.**8**, Q.**9** or Q.**10**, Q.**11** or Q.**12**.*

*3) **Neat** diagrams must be drawn **wherever** necessary.*

*4) Figures to the **right** indicate **full** marks.*

SECTION – I

1. a) Name the various types of authoring tools that exist for multimedia. Explain any one in details. **10**

   b) With the help of suitable example explain the Bresenham's line drawing algorithm. **8**

OR

2. a) Explain the steps involved in flood fill and boundary fill algorithms. **8**

   b) What is shading ? List the salient features of different types of shading methods. **10**

3. a) What is a homogeneous coordinate system ? What do you mean by composite coordinates ? **8**

   b) Derive the transformation matrix for rotating a point M(x, y) by an angle $\theta$ about a point $P(x_0, y_0)$ in two dimensions. **8**

OR

4. a) What is line clipping ? Explain the steps in the Cohen Sutherland line clipping algorithm. **8**

   b) Explain the steps of Sutherland Hogman polygon clipping algorithm. **8**

**P.T.O.**

5. a) What is aliasing and anti aliasing ? Explain with a suitable example. **10**

   b) What are the various storage media for multimedia ? **6**

OR

6. Write short notes on the following :
   a) Vector scan and raster scan display **4**
   b) 3D Rotation about X-axis **6**
   c) Scan line seed fill algorithm. **6**

SECTION – II

7. a) What is MIDI file and explain commands of MIDI file. **8**

   b) Explain characteristics of sound. **8**

OR

8. a) Describe audio file format supported by Windows OS. **8**

   b) What are the compression techniques in audio ? Explain PCM in detail. **8**

9. a) What are the steps in designing an animation sequence ? **6**

   b) What are different types of animation techniques ? Explain in brief. **6**

   c) Explain color model used for CRT display. **6**

OR

10. a) Explain the salient points of color models RGB, YUV, CMY. **9**

    b) What is computer controlled animation ? What is segmentation in animation ? **9**

11. a) Explain different types of loss less data compression techniques. **8**

    b) Explain MPEG compression. **8**

OR

12. Write short notes on :
    a) BMP file format **6**
    b) LZW encoder **4**
    c) Quantization in JPEG. **6**

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**[3863] – 153**

# T.E. (Information Technology) (Semester – I) (Examination, 2010
# DATA COMMUNICATION AND NETWORKING
# (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) Assume suitable data, if* ***necessary****.*

SECTION – I

1. A) What do you understand by signal to noise (S/N) ratio? Explain Shannon's channel capacity. **5**

   B) Explain QAM and its advantages. Also draw the constellation patterns for 8-QAM, 16-QAM. **5**

   C) Generate the CRC code for message 1101010101.

   Given generator polynomial $g(x) = X^4 + x^2 + 1$. **8**

   OR

2. A) What are the advantages of digital signals over analog signals ? **5**

   B) What is channel capacity ? How is it related to channel bandwidth ? Example with an appropriate formula. **5**

   C) Discuss the hamming code technique. Calculate hamming code if data to be sent is 1001101. **8**

3. A) Discuss how ADSL technology used in modems. **8**

   B) State the difference between circuit switching and packet switching. **8**

   OR

4. A) Describe the T1 frame structure. Also state the capacities of E1, E2, E3 and E4 lines. **8**

   B) Discuss ADSL, DMT, HDSL technologies in brief. **8**

5. A) Explain with suitable examples guided transmission media and unguided transmission media. **8**

   B) **Compare :** **8**

   1) Step index and graded index fibers

   2) Single mode and multimode fibers.

OR

6. A) Explain the coaxial cable and its various categories. Also state the data rate and the use of every category. **8**

   B) Explain different losses in the fiber-optic communication. **8**

SECTION – II

7. A) Explain TCP/IP protocol stack. **8**

   B) Explain the merits and demerits of Star, Bus, Ring and Mesh Topologies. **8**

OR

8. A) Describe the functions of all the layers of the OSI reference model in short. **8**

   B) Compare Bridge, Switch, Hub, Repeater. **8**

9. A) Explain stop and wait ARQ, GO Back-n ARQ and selective repeat ARQ. Comment on the performance of each. **10**

   B) Explain ALOHA, Slotted ALOHA and CSMA. Comment on the efficiency of each random access technique. **8**

OR

10. A) Discuss the HDLC protocol specification with reference to the following : **10**

    1) Station types

    2) Configurations

    3) Modes of communication

    4) Types of frames.

    B) Discuss CSMA/CD Random Access technique in detail. **8**

11. A) Discuss the working of VLAN. Also state its advantages. **8**

    B) What is the difference between 10 Base 5, 10 Base 2 and 10 Base T specification. **8**

OR

12. A) Write a short note on Gigabit Ethernet. Compare Gigabit Ethernet with Traditional Ethernet. **8**

    B) What is FDDI ? Explain FDDI frame types. **8**

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# [3863] – 154

## T.E. (Information Technology) (Semester-I) Examination, 2010
## (2003 Course)
## THEORY OF COMPUTATION

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.***

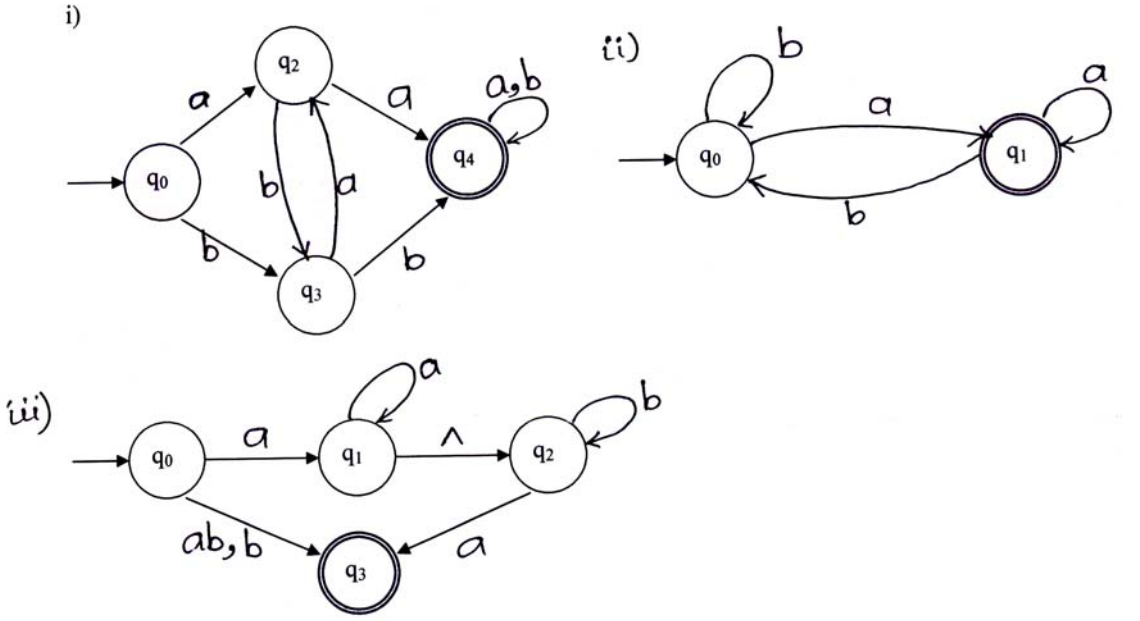
SECTION – I

1. a) Describe in simple english the language defined by following regular expressions : **4**

   i) (a+b)* aa (a+b)** ii) (b+ba)*

   iii) a (a+b)*b iv) $a^+b^*c^+$

   b) Express the language accepted by following Transition Graph in the form of regular expressions. **6**




**P.T.O.**

c) Design a FSM for divisibility tester of urinary number by 2. **8**

OR

2. a) Write the regular expressions for :

i) $\sum = \{a,b,c\}$ the language containing strings, such that each string has "any number of a's followed by any number of c's".

ii) $\sum = \{0,1,2\}$, and language set L(r) = {0,2,01,21,011,211,0111,...}

iii) $\sum = \{0,1\}$ and language set L(r) = {00,010,0110,01110,....}

iv) Language defined over $\sum = \{a,b\}$ has to have the strings beginning with 'a' and not to have two consecutive a's

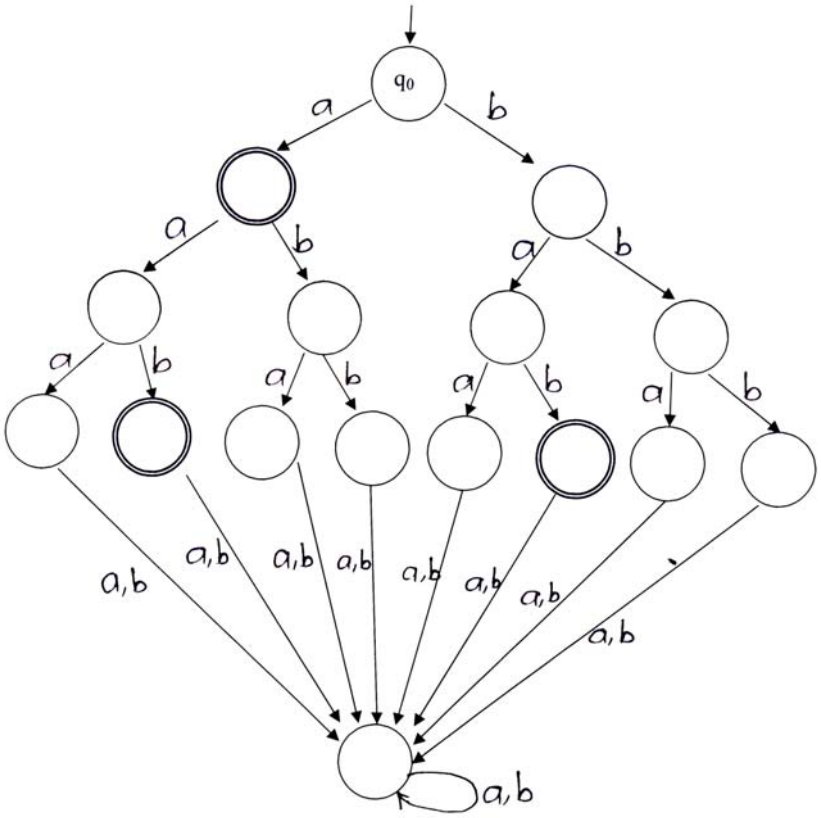
v) $\sum = \{a,b\}$ such that each of string do not have aa or bb as a substring in it.

vi) $\sum = \{0,1)$ the language such that it contains strings with even number of 0's. **8**

b) What are the properties and limitations of Finite State Machine ? **6**

c) Prove that for any $\Sigma$, $\Sigma^* = \Sigma^{**}$ **4**

3. a) Consider the following F A

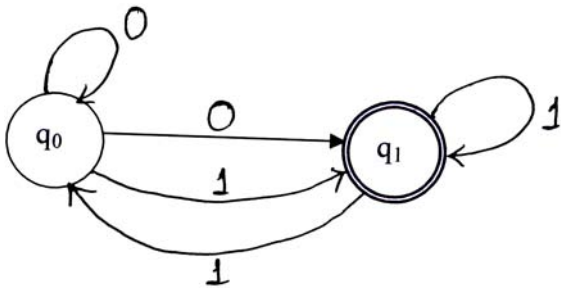


Answer the following questions :

i) What is the max length of string accepted by this F A ?

ii) What are the words accepted by this F A ? **4**

b) Show stepwise process of constructing DFA equivalent to the NFA : **6**




c) Design FA that reads strings made up of $\Sigma = \{0,1\}$ and accepts only those strings which ends with "00" or by "11". **6**

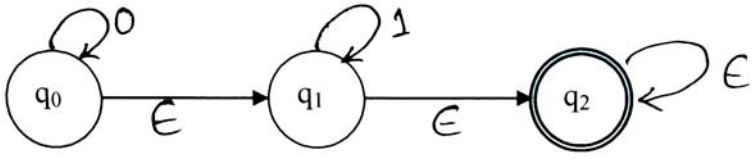
OR

4. a) State true or false

i) Moore machine can have arbitrary number of final states.

ii) Mealy machine can have arbitrary number of start states. **2**

b) Construct NFA without $\in$ moves for the following NFA with $\in$ moves. **6**




c) Design a Moore machine which will recognize the language of all words of the form (a+b)* aa(a+b)*. Let the machine display "A" for acceptance and "R" for rejection of words. **8**

5. a) Write a CFG over $\Sigma$={a,b} such that CFL is palindrome. Show the derivation of the string "aabbaa" using the resulting grammar. **4**

   b) Convert the following CFG to it's equivalent CNF (clearly show the steps involved if any)

   $S \rightarrow 0S0 \mid 1S1 \mid 0 \mid 1 \mid 00 \mid 11$ **6**

   c) Eliminate $\varepsilon$ productions from the grammar G :

   $S \rightarrow ABCa \mid bD$

   $A \rightarrow BC \mid b$

   $B \rightarrow b \mid \varepsilon$

   $C \rightarrow c \mid \varepsilon$

   $D \rightarrow d$ **6**

OR

6. a) Write a CFG over $\Sigma$ = {a,b} containing at least occurrence of "aa". **4**

   b) Write a CFG for (a+b)* bbb (a+b)*. **6**

   c) Simplify the following grammar.

   $S \rightarrow Ab$

   $A \rightarrow a$

   $B \rightarrow C/b$

   $C \rightarrow D$

   $D \rightarrow E$

   $E \rightarrow a$ **6**

SECTION – II

7. a) Find CFL defined by following CFG

$S \rightarrow aB \mid bA$

$A \rightarrow a \mid aS \mid bAA$

$b \rightarrow b \mid bS \mid aBB$ **4**

b) Convert the following right linear grammar to equivalent left linear grammar :

$S \rightarrow IP$

$P \rightarrow IQ$

$Q \rightarrow 0P$

$Q \rightarrow 0$

$P \rightarrow 1$ **6**

c) Show that $L = \{ww \mid w \in \{a,b\}^*\}$ is not a context free language. **8**

OR

8. a) With respect to CFL state whether the following statements are true or false. Justify your answers :

i) Context free languages need not be closed under union.

ii) Context free languages are closed under product

iii) If L is CFL the L* also will be CFL **6**

b) Give the left linear grammar for RE $(10)^*1$ **6**

c) Give the right linear grammar for RE 0*1(0+1)* **6**

9. a) Design a PDA to accept the language :

$L = \{a^n b^n \mid n >= 0\}$

(Let your answer be either in the pictorial form or mathematical model) **8**

b) Design a PDA to accept a language defined by the following CFG -

$S \rightarrow 0BB$

$B \rightarrow 0S|1S|0$

Test whether 010 is accepted by the above PDA. **8**

OR

10. a) Compare PDM and FSM. **4**

b) Construct PDA equivalent to CFG , which defines language containing all strings only with even number of a's. Simulate the working of this PDA for the input "aa". **8**

c) Define PDA. Enlist at least any two applications of PDA. **4**

11. a) Design TM to increment value of binary number by one. **6**

b) Design TM to accept the set L of all strings over {0,1} ending with 010. **6**

c) State true or false :

i) FSM is a special case of the TM.

ii) TM can be deterministic.

iii) TM has an external memory which can remember arbitrary long sequences of inputs.

iv) Basis of TM is divide the process into primitive operations. **4**

OR

12. a) Design a TM to recognize all strings consisting of even number of 1's **8**

b) Explain the following

i) Composite T.M and iterative T.M

ii) Universal T.M **8**

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# [3863] – 156

## T.E. (Information Technology) (Semester – II) Examination, 2010
## COMPUTER NETWORK TECHNOLOGY
## (2003 Course)

Time : 3 Hours Max. Marks : 100

***N.B.*** *: 1) Answers to the **two** Sections should be written in **separate** books.*
*2) **Neat** diagrams must be drawn **wherever** necessary.*
*3) Assume **suitable** data, if **necessary**.*

SECTION – I

1. a) What do you mean by congestion ? Discuss the open-loop and closed-loop congestion control mechanism ? **8**

   b) What is the purpose of ARP and RARP ? What is the size of Ethernet frame carrying an ARP packet ? **8**

   OR

2. a) Discuss the design issues of the network layer. **8**

   b) Draw and explain IPv4 header format ? **8**

3. a) Explain TCP with its header format. **8**

   b) Explain the three way of handshake for connection establishment in TCP. **8**

   OR

4. a) Explain UDP header format and two applications of UDP. **8**

   b) List and discuss the performance issues of transport layer. **8**

5. a) Explain the function of E-mail system. **6**

   b) Explain static, dynamic and active pages. **6**

   c) What do you mean by statelessness and cookies ? Explain. **6**

   OR

**P.T.O.**

6. Write short notes on **(any three)** : **18**
   a) DNS.
   b) SMTP.
   c) HTTP.
   d) FTP.

SECTION – II

7. a) Explain the techniques used in communicating stored audio/video files. **8**
   b) Explain various scheduling mechanisms used in communication of multimedia application. **8**

OR

8. a) What is the essence of RSVP ? Why this protocol is needed ? **8**
   b) Differentiate between SIP and H.323 protocols ? **8**

9. a) What is purpose of SMI and MIB in relation to SNMP ? **8**
   b) What is DHCP ? Explain its frame format. **8**

OR

10. a) List the five areas of network management and explain the necessity of each. **8**
    b) What is BOOTP ? Explain its frame format. **8**

11. Write short notes on : **18**
    a) Frame relay.
    b) SMDS.
    c) Bluetooth
    d) B-ISDN services.

OR

12. Write short notes on **(any three)** : **18**
    a) ISDN.
    b) ATM layers.
    c) X.25.
    d) IEEE 802.11.

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**[3863] – 159**

# T.E. (Information Technology) (Semester – II) Examination, 2010
# SOFTWARE ENGINEERING
# (2003 Course)

Time : 3 Hours Max. Marks : 100

***Instructions :*** *1) Answers to the **two** Sections should be written in **separate** answer books.*

*2) From Section **I** answer Q. **1** or Q. **2**, Q. **3** or Q. **4**, Q. **5** or Q. **6** and Section **II** answer Q. **7** or Q. **8**, Q. **9** or Q. **10**, Q. **11** or Q. **12**.*

*3) **Neat** diagrams must be drawn **wherever** necessary.*

*4) Figures to the **right** indicate **full** marks.*

## SECTION – I

1. a) State the characteristics of software. **3**

   b) State the practitioner's myths. **4**

   c) Explain the failure curve of software. **4**

   d) What are the goals of Project planning in CMMI level 5 ? **3**

   e) What are the practices of project planning in CMMI level 5 ? **4**

   OR

2. a) Explain the RAD software process model in brief. **6**

   b) Explain the Unified Processing model in brief. **6**

   c) State the umbrella activities in the software process frame work. **6**

3. a) What is the essence of software engineering best practices ? **2**

   b) What is the importance of communication ? State communication practices. **6**

   c) What is the focus of construction practices ? Explain coding principles. **8**

   OR

**P.T.O.**

4. a) What is the objective of software testing ? **2**

   b) Explain the testing principles. **6**

   c) What are the elements of product engineering hierarchy ? Explain in brief. **8**

5. a) State the requirement engineering tasks. **3**

   b) Explain the class based elements in detail. **5**

   c) Define the following in the context of data modelling : **8**

      i) Data attributes

      ii) Relationships

      iii) Cardinality

      iv) Modality.

OR

6. a) Draw a data flow diagram (level 0, level 1 and level 2) for securing first year engineering admission in a college. **(1+2+5=8)**

   b) Write a note on behavioural elements in the analysis model. **8**

SECTION – II

7. a) State design principles. Explain modularity in detail. **8**

   b) Explain data centred architecture design in detail. **10**

OR

8. a) Narrate the steps in user interface design. **6**

   b) Explain the call return architecture in brief. **6**

   c) Explain the pipe and filter in brief. **6**

9. a) What are the categories of software resources ? List the details of each type. **8**

   b) What are the four P in software project management spectrum ? Explain the people factor towards the success of the project. **8**

OR

10. a) What is the software measurement objective ? What is OO metric ? **8**

    b) Explain the LOC based software estimation in detail. **8**

11. a) What is the need of SCM ? What is the role of SCM repository in SCM ? **8**

    b) What is configuration audit ? **4**

    c) What is status reporting ? **4**

OR

12. a) What is forward engineering and reverse engineering ? Explain in brief. **8**

    b) How is reverse engineering used in understanding data and process ? **8**

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**[3863] – 16**

# T.E. (Mech.) (Semester – II) Examination, 2010
# TRANSMISSION SYSTEM DESIGN
# (2003 Course)

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) 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) Discuss "Load-Life" Relationship for rolling contact bearings. **3**

b) A shaft is supported on two bearings A and B which are 250 mm apart. A gear is attached at a distance of 100 mm on the right from left hand side bearing A. Weight of a pulley is 100 N which is attached at an overhung of 150 mm on the right of right hand side bearing B. Horizontal belt tensions are 498 N and 166 N respectively. Horizontal tangential force component for the gear is 497 N which is directed same as belt tensions. Vertically downward radial force component for the gear is 181 N. The load factor for application is 2.5 and expected life of bearings is 8000 hours. If the shaft speed is 720 rpm find dynamic load capacity for bearings A and B so that they can be selected from manufacturer's catalogue. **13**

OR

2. a) Discuss preloading of rolling contact bearings. **3**

   b) An equivalent radial load on a bearing varies continuously from 0 to 20 kN in a sinusoidal manner. Determine the dynamic load rating at 90% reliability, if the bearing is to have a life of 20 million revolutions at a reliability of 99%. Assume shaft speed as 1000 rpm.

   Use Life Reliability relationship as

   $$\frac{L}{L_{10}} = \left[ 9.491 \log_e \left( \frac{1}{R} \right) \right]^{\frac{1}{1.17}}.$$ **13**

## Unit – II

3. a) Discuss different type of clutches. **3**

   b) For a single plate clutch consisting only one pair of contacting surfaces, Derive a relation for optimum ratio of inner diameter of friction disk to outer diameter of friction disc, which will yield maximum torque transmitting capacity.

   Assuming maximum torque transmitting capacity for a clutch, find its inner and outer diameter of friction lining using following information :

   Number of pairs of contacting surfaces : 1

   Maximum torque transmitted : 120 Nm

   Load factor : 1.5

   Permissible intensity of pressure : 350 kPa

   Coefficient of friction : 0.35

   Assume uniform wear theory. **13**

OR

4. a) Discuss energy absorbed by brakes. **3**

   b) A double pivoted shoe brake is as shown in Fig. 1. Find torque, that can be sustained by the brake when the drum is rotating in clockwise rotation.

   Assume coefficient of friction between the shoe and the drum as 0.28. **13**

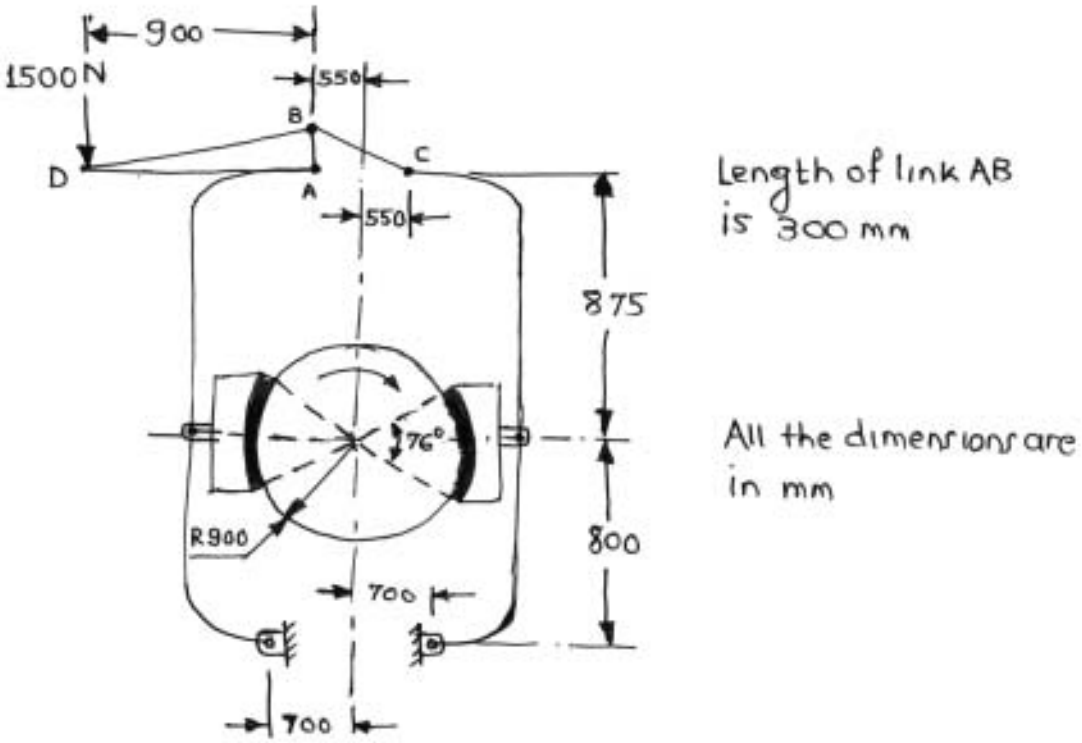


Fig. 1 [Q.4 (b)]

## Unit – III

5. a) Discuss different belt-tightening (tensioning) methods. **3**

   b) Derive a relation for optimum velocity of a belt for maximum power transmission capacity in turms of total tension in tight side of the belt and mass per unit length of the belt. **6**

c) A single V-belt is used to transmit power from a grooved pulley of pitch diameter 200 mm running at 1500 rpm to a flat pulley running at 500 rpm. The central distance between the pulleys is 1m. Mass of 1 meter length of the belt is 300 gm. The coefficient of friction between the pulley and the belt is 0.25. For the belt allowable tension is 800 N. Assuming groove angle for the grooved pulley as 38°. Find power capacity of belt and Initial tension required in the belt. **9**

OR

6. a) Discuss relative advantages and limitations of chain drives. **3**

b) A hoisting wire rope is required to raise a load of 500 kg at maximum acceleration of $1 m/s^2$. The modulus of elasticity and ultimate tensile strength for the rope is 83000 MPa and 1230 MPa respectively. Factor of safety required against static failure is 5.

Select size of wire rope and sheave and check safety of the wire rope using following data :

Diameter of sheave is 45 times nominal diameter of wire rope Ratio of limiting value of bearing pressure to ultimate tensile strength is limited to 0.0014.

Factor of safety against Fatigue failure is 1.03

Ratio of nominal diameter of wire rope to diameter of each wire in the rope is 16

Cross-sectional area of wires in the rope is $0.404d^2$ where d is nominal diameter of wire rope.

Breaking strength of wire rope is 54000N. **15**

SECTION – II

**Unit – IV**

7. a) Discuss standard system of Gear tooth. **6**

b) Explain why Involute profile is preferred over cycloidal profile for gear tooth. **2**

c) The pitch circles for a train of spur gears are shown in Fig. 2. Gear 'A' receives 3.5 kW at 700 rpm through its shaft and rotates in the clockwise direction. Gear 'B' is the idler gear while gear 'C' is the driven gear. The number of teeth on gear 'A', 'B' and 'C' are 30, 60, 40 respectively. While the module is 5 mm calculate the torque on each gear shaft and the components of gear tooth forces. Draw a free body diagram of forces and determine the reaction on the idler gear shaft. Assume 20° full depth involute system for gears. **9**

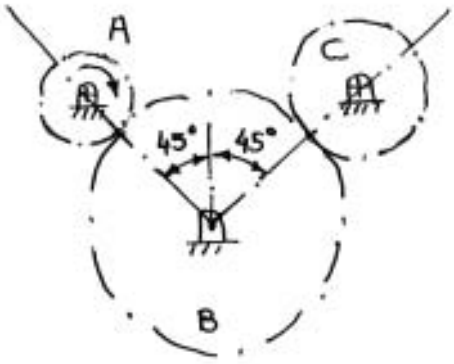


Fig. 2 [Q.7(c)]

OR

8. a) Discuss lubrication of gears. **3**

b) A pinion having 22 number of teeth is to mesh with a gear having 60 number of teeth. Both the pinion and the gear are made up of steel having ultimate tensile strength 600 MPa and 300 MPa respectively. The pinion is connected to a 10 kW, 1440 rpm three phase induction motor. Design the gear pair and specify the surface hardness required on gear teeth using following data :

Starting torque of the motor is 30% greater than the rated torque.

Face width is ten times the module

Load distribution factor is 1.2

Deformation factor is 80 N/mm

Factor of safety 1.75

Velocity factor is given by $\frac{6}{6+V}$

Lewis form factor $Y = 0.484 - \frac{2.87}{Z}$

Buckingham's equation for dynamic load is

$$P_d = \frac{21V\,(bc + P_{t\max})}{21V + \sqrt{bc + P_{t\max}}}$$

Standard modules are 3, 4, 5, 6, 8, 10, 12, ... **14**

## Unit – V

9. a) Derive a relation for virtual number of teeth for a helical gear. **3**

   b) A helical pinion having 21 number of teeth is made of carbon steel having ultimate tensile strength 720 MPa. The gear meshing with the pinion is made of steel having ultimate tensile strength 580 MPa. The pinion transmits 10 kW at 1000 rpm. Speed of the gear is 300 rpm. The starting torque is 125% of rated torque. Factor of safety required is 1.25. The face width is 10 times the normal module. Helix angle is 25°. The gear and the pinion are having surface hardness 300 BHN and 350 BHN respectively. Design the gear pair using Bukingham's equation for Dynamic load. Assume Deformation factor 'C' for gear pair as 11500 e N/mm

Use $K_V = \frac{5.6}{5.6 + \sqrt{V}}$

$$e = 8.0 + 0.63\left[M_n + 0.25\sqrt{d}\right]$$

$$Y' = 0.484 - \frac{2.87}{Z'}$$

$$P_d = \frac{21V\,(bc\cos^2\psi + P_{t\max})}{21V + \sqrt{bc\cos^2\psi + P_{t\max}}}\cos\psi$$

Standard values of normal module ..., 3, 4, 5, 6, 8, 10,... **14**

OR

10. a) Explain Formative number of teeth for bevel gears. **3**

b) A straight bevel pinion having 25 number of teeth is made of alloy steel having ultimate tensile strength of 840 MPa. The pinion has to mesh with a gear having 60 number of teeth and made of alloy steel having ultimate strength of 690 MPa. The pinion is connected to a 8.5 kW, 1440 rpm electric motor whose starting torque is 125% of rated torque. The factor of safety assumed is 1.1. The pinion and the gear are hardened to 450 and 400 BHN respectively. The deformation factor is given by 11000 e... N/mm where e is given by $5 + 0.4\phi$. The tolerance factor $\phi$ is given by $m + 0.25\sqrt{d}$. Axes of the pinion and the gear are at right angles. Design the gear pair assuming velocity factor as $\frac{6}{6+V}$ and Lewis form factor as $Y = 0.484 - \frac{2.87}{Z}$

Use standard module series as 2, 3, 4, 5, 6, 8, ... **14**

## Unit – VI

11. a) Explain Force analysis for a worm gear drive. **6**

b) A worm transmits 3 kW at 1440 rpm to a gear having 60 number of teeth. The PCD for the triple start worm is 90 mm. Module for the gear is 4 mm. The worm is having right hand helix, it is above the gear and it rotates in anticlockwise sense looking from right. Calculate force components for both the pair members. Decide direction of forces and find efficiency of drive. **10**

OR

12. a) Discuss the thermal considerations in worm gear drive. **3**

b) A worm gear pair 2/40/10/4 is having phosphor bronze gear with ultimate tensile strength 300 MPa. The worm is made of steel with ultimate strength 740 MPa. The coefficient of friction between the worm and the worm gear is 0.03 and normal pressure angle 20°. The worm gear wear factor is 0.9 $N/mm^2$. The overall heat transfer coefficient for the gear box is 18 $W/m^2°C$. The permissible temperature rise for lubricating oil is 50°C. The worm rotates at 720 rpm and service factor is 1.5.

Determine input power rating based on beam strength, wear strength and thermal consideration.

Assume effective surface area of gear box as 0.8 $m^2$ and factor of safety as 1.5. **13**

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# [3863] – 162

## T.E. (Biotechnology) (Semester – I) Examination, 2010
## BIOSEPARATIONS
## (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 various methods of cell disruption ? Give detailed account of Chemical methods of cell disruption. **18**

OR

2. Write short notes on : **(6 marks each)**
   a) Structure of the cell wall
   b) Themolysis
   c) Rotor stator homogenizer.

3. Explain in detail affinity chromatography. What are various types of affinity chromatography ? What are various ligand binding techniques involved ? **16**

OR

4. Give elaborate description of paper chromatography. What are different types of paper chromatography ? **16**

5. Discuss all techniques of membrane cross flow filtration. **16**

OR

6. Write short notes on : **(4 marks each)**
   a) Flocculation
   b) Density gradient centrifugation
   c) Ultrafiltration
   d) Sedimentation.

**P.T.O.**

SECTION – II

7. Give broad classification of biomolecules. Outline the small biomolecules. **16**

OR

8. List the characteristics of fermentation broth. **16**

9. What is solvent extraction ? Give an account of conventional liquid-liquid extraction. **18**

OR

10. Write notes on : **(9 marks each)**

a) Drying

b) Freez drying.

11. What are the stages of purification ? Which methods are employed in primary stage of recovery ? **16**

OR

12. Give flow sheets with explanation of these example. **16**

a) Citric acid production.

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# [3863] – 166

## T.E. Biotechnology (Semester – II) Examination, 2010
## IMMUNOLOGY
## (2003 Course)

Time : 3 Hours Max. Marks : 100

***N.B.*** *: i) Answer to **two** Sections should be written in **separate** answer books.*

*ii) Draw neat diagrams **wherever** necessary.*

*iii) **Maximum** marks for each question is given in **parentheses.***

SECTION – I (Maximum Marks **50)**

1. Describe the structure, characteristics and function of Immunoglobulin. **(18)**

OR

2. Distinguish between humoral immunity and cell mediated immunity. What are the different components of humoral immunity? **(18)**

3. What are the different types of antigen-antibody interactions? Explain with suitable example the use of antigen-antibody interaction in immunodiagnostics. **(16)**

OR

4. Explain antigen processing and presentation by MHC class I molecule. **(16)**

5. Write short notes on **any two** : **(16)**

   a) Role of B cells in immunity

   b) Enzyme Linked Immunosorbent Analysis

   c) Lymphoid organs

**P.T.O**

SECTION – II (Maximum Marks **50)**

6. Explain the process of T helper cell activation in detail **(18)**

OR

7. Enumerate the type of cytokines produced by TH1 and TH2 cells. Explain their biological activities. **(18)**

8. Define tumor antigens and give their significance in immunology. **(16)**

OR

9. Give a brief account of the different types of hypersensitivity. **(16)**

10. What is immunization? Describe the different types of vaccines. **(16)**

OR

11. Explain immunological tolerance and autoimmunity with suitable example. **(16)**

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**[3863] – 168**

# T.E. (Bio. Tech.) (Sem. – II) Examination, 2010
# COMPUTATIONAL TECHNIQUES AND PROCESS MODELING
# (2003 Course)

Time : 3 Hours Total 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 Eigen values and Eigen vectors of **4**

$$\begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{bmatrix}.$$

b) Find the characteristic equation for **2**

$$\begin{bmatrix} 1 & 3 & 3 \\ 1 & 4 & 3 \\ 1 & 3 & 4 \end{bmatrix}.$$

c) Find the product of Eigen values of **4**

$$\begin{bmatrix} 7 & 2 & 2 \\ -6 & -1 & 2 \\ 6 & 2 & -1 \end{bmatrix}.$$

d) Solve the following equations by using Guass Siedal method. **6**

$5x + 3y + 7z = 4,$

$3x + 26y + 2z = 9,$

$7x + 2y + 10z = 5.$

OR

2. a) Explain the properties of Eigen values. **4**

   b) Find the values of $\lambda$ for which the equations **8**

   $(\lambda-1)x+(3\lambda+1)y+2\lambda z=0,$

   $(\lambda-1)x+(4\lambda-2)y+(\lambda+3)z=0,$

   $2x+(3\lambda+1)y+3(\lambda-1)z=0$

   are consistent. Find the ratios of x:y:z when $\lambda$ has the smallest of these values. What happens when $\lambda$ has greatest of these values ?

   c) Find the Eigen values and Eigen vectors of **4**

   $$\begin{bmatrix} 3 & 2 & 4 \\ 2 & 1 & 1 \\ 1 & 3 & 5 \end{bmatrix}.$$

3. a) The following are the results of an experiment on friction of bearings. The speed being constant, corresponding values of coefficient of friction and temperature are given. If $\mu$ and t are related by the law $\mu = ae^{bt}$, find the values of a and b. **8**

| t | 120 | 110 | 100 | 90 | 80 | 70 | 60 |
|---|---|---|---|---|---|---|---|
| $\mu$ | 0.0051 | 0.0059 | 0.0071 | 0.0085 | 0.00102 | 0.00124 | 0.00148 |

   b) Using Newton's iterative method, find the roots of **8**

   $x^2 + y = 20,$

   $x + y^2 = 10.$

OR

4. a) Using Runge Kutta method of fourth order,

   solve $dy/dx = (y^2 - x^2)/(y^2 + x^2)$ with $y(0) = 1$ at $x = 0.2$ and 0.4. **8**

   b) A solid of revolution is formed by rotating about x - axis, the arc between the x-axis, the lines x = 0 and x = 1 and a curve through the points with the following coordinates. Estimate the volume of the solid formed using Simpson's rule. **8**

| **x** | 0.00 | 0.25 | 0.5 | 0.75 | 1.00 |
|---|---|---|---|---|---|
| **y** | 1.00 | 0.98 | 0.95 | 0.90 | 0.84 |

5. a) Express $y = 4x^3 - 5x^2 + 10x - 12$ in factorial notation and hence show that $\Delta^3 y = 24$. **4**

   b) Construct a forward difference table for the following data and evaluate $\Delta^3 f(3)$. **6**

| **x** | 0 | 1 | 2 | 3 | 4 |
|---|---|---|---|---|---|
| **f(x)** | 1 | 4 | 9 | 16 | 25 |

   c) Construct Newton's backward interpolation polynomial for the following data. **6**

| **x** | 4 | 6 | 8 | 10 | 12 |
|---|---|---|---|---|---|
| **y** | 2 | 3 | 4 | 5 | 6 |

   d) Explain the terms : **2**
   i) Interpolation techniques
   ii) Extrapolation techniques.

OR

6. a) Evaluate $\Delta\ ((2x + 1)/x^2 + 7x + 12))$ interval of differencing being unity. **4**

   b) Find the missing values in the following table. **6**

| **x** | 45 | 50 | 55 | 60 | 65 |
|---|---|---|---|---|---|
| **y** | 3.0 | 2.925 | --- | 0.225 | --- |

   c) Form the table of forward differences of the function $f(x) = x^3 - 3x^2 - 5x - 7$ for $x = -1, 0, 1, 2, 3, 4, 5$. **4**

   d) The table gives the distances in nautical miles of the visible horizon for the given heights in feet above the earth's surface. Find the values of y when x = 255 Ft. where x is height and y being the distance. **4**

| **x** | 100 | 150 | 200 | 250 | 300 | 350 |
|---|---|---|---|---|---|---|
| **y** | 12.00 | 14.53 | 16.83 | 18.60 | 20.23 | 24.22 |

SECTION – II

7. a) Explain process modeling and simulation with a suitable example. **4**

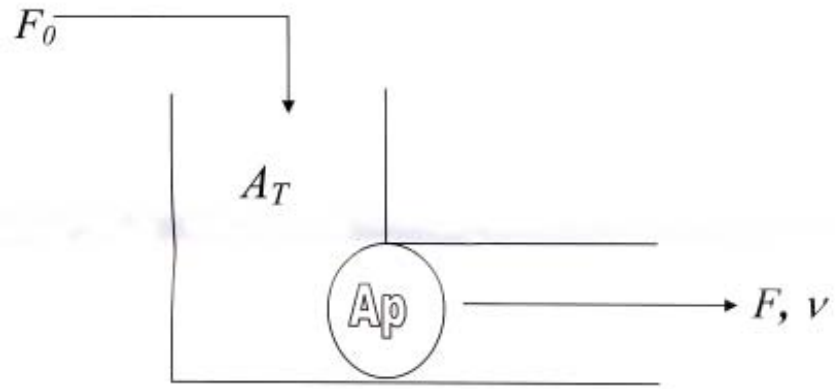
   b) What are the principles of formulation of mathematical model ? Explain briefly. **4**

   c) What are the fundamental laws which are applicable in process modeling ? Explain in detail. **4**

   d) Explain in detail about transport equations and equations of state. **4**

OR

8. a) An incompressible liquid is pumped at a volumetric flow rate of $F_0$. The height of the liquid in the vertical cylindrical tank is "h". The output flow rate is "F". Let the length of the exit line be L and its cross sectional area $A_p$. The tank has a cross sectional area $A_T$, the velocity of liquid from the tank is $\nu$. Write the modeling equations for the system. **8**




b) Write component continuity equations with 1st order reaction taking place in a CSTR for **8**

i) Consecutive reactions ii) Reversible reactions

9. Derive mathematical modeling equation for a binary distillation column. Discuss the degrees of freedom state all the necessary assumptions. **18**

OR

10. A wetted wall column is to be used for the absorption of gas "A". Gas is consumed in liquid phase by a 1st order reaction in terms of gas concentration "A" in liquid phase in the form of a differential equation. Derive a mathematical model equation for gas absorption with such chemical reaction. **18**

11. a) Explain the terms : **8**

i) Limited growth ii) Unlimited growth

iii) Suspended growth reactors iv) Attached growth reactors

b) Explain the theory of fed batch culture control with application for baker's yeast. **8**

OR

12. a) Explain the terms : **8**

i) Sparged bioreactors ii) Aerobic bioreactors

iii) Activated sludge systems iv) Substrate growth in chemostats

b) Derive a mathematical model for Ethanol fermentation in a batch scale bioreactor. **8**

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**[3863] – 17**

# T.E. (Mechanical) (Semester – II) Examination, 2010
## (2003 Course)
## TRIBOLOGY

Time: 3 Hours Max. Marks: 100

***Instrutions :*** *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 is **allowed**.*
*4) Assume suitable data, **if necessary**.*

SECTION – I

1. a) What do you mean by Viscosity Index ? Explain the procedure to find viscosity index of test oil. **6**

   b) A full journal bearing has a journal of 50 mm diameter and runs concentrically inside a 75 mm long bearing with a radial clearance of 0.025 mm. If the journal speed is 1500 rpm and the viscosity of the lubricant is 40 Mpa. sec. at 35°C, calculate the following at this temperature : **6**
   i) The value of the tangential drag force on the journal
   ii) The value of the viscous shear stress, and power loss in viscous friction.

   c) Explain the process and methods of recycling of the used oil. **4**

OR

2. a) What do you mean by tribology ? Explain importance of tribology in Industry. **6**

   b) Explain Extreme Pressure (EP) lubricants. Where they are used ? **6**

   c) Compare sliding contact bearings with rolling contact bearings for following parameters : **4**
   i) Load carrying capacity ii) Noise
   iii) Speed iv) Shaft and Housing Design.

**P.T.O.**

3. a) What do you mean by stiction ? Give examples. What are the methods to reduce stiction ? **6**

   b) Derive Archard's equation for volume of adhesive wear with assumptions made. State Laws of wear using above equation. **8**

   c) Explain pin-on-disc method to measure coefficient of friction. **2**

OR

4. a) Using modified junction growth theory, prove that the coefficient of friction is given as : $f_a = \frac{k}{\sqrt{4[1-k^2]}}$ with usual notations. **8**

   b) Write short note on (i) Fretting wear and (ii) Percussion wear **6**

   c) State different techniques used for wear debris analysis. **2**

5. a) With usual notations, derive an expression for pressure distribution in case of infinitely short journal bearings. Show the axial and circumferential pressure distribution. **12**

   b) Explain mechanism of pressure development in hydrodynamic lubrication with the help of two non-parallel surfaces separated by convergent film. **4**

   c) Derive the relation $\frac{h_0}{C} = 1 - \in$ for hydrodynamic journal bearings. **2**

OR

6. a) The following data refers to a 360° hydrodynamic journal bearing. **12**

| | |
|---|---|
| Radial load | = 10 kN |
| Journal Speed | = 1450 rpm |
| L/D ratio | = 1 |
| Bearing Length | = 50 mm |
| Radial Clearance | = 20 microns |
| Eccentricity | = 15 microns |
| Specific gravity of the oil | = 0.86 |
| Specific heat of the lubricant | = 2.09 KJ/kg°C |

Calculate :

i) The minimum oil film thickness

ii) The coefficient of friction

iii) The power lost in friction

iv) The viscosity of the lubricant

v) The total flow rate of lubricant in lpm

vi) The side leakage.

Use the data given below :

| $\left(\frac{l}{d}\right)$ | $\varepsilon$ | $\left(\frac{h_0}{c}\right)$ | **S** | $\phi$ | $\left(\frac{r}{c}\right)f$ | $\left(\frac{Q}{rcn_s l}\right)$ | $\left(\frac{Q_s}{Q}\right)$ | $\left(\frac{P}{p_{max}}\right)$ |
|---|---|---|---|---|---|---|---|---|
| 1 | 0 | 1.0 | $\infty$ | (85) | $\infty$ | $\pi$ | 0 | – |
| | 0.1 | 0.9 | 1.33 | 79.5 | 26.4 | 3.37 | 0.150 | 0.540 |
| | 0.2 | 0.8 | 0.631 | 74.02 | 12.8 | 3.59 | 0.280 | 0.529 |
| | 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 | – |

Note : Assume linear interpolation for intermediate values.

b) Compare long and short journal bearings with the help of following points : **6**

i) Fluid film pressure, ii) Pressure gradient,

iii) Fluid flow, iv) Load carrying capacity.

SECTION – II

7. a) Derive the equation for flow rate through rectangular slot. **8**

b) State the advantages of hydrostatic bearings. **2**

c) Prove that the optimum stiffness of hydrostatic bearing is : **6**

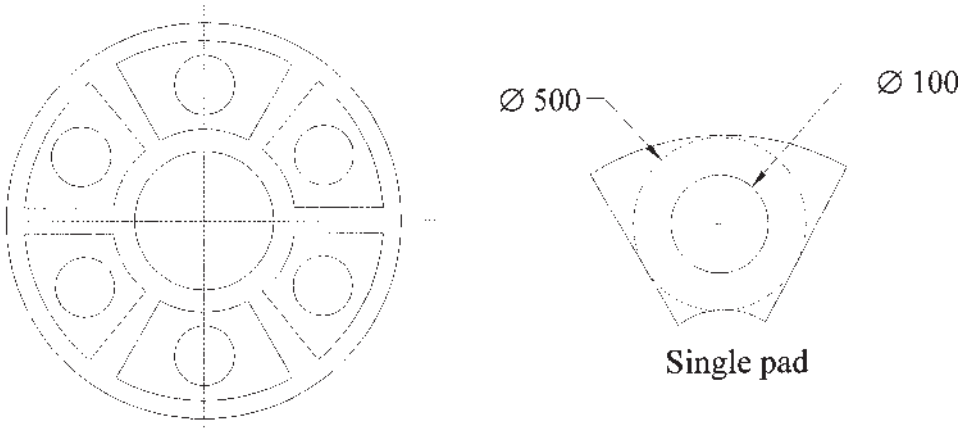
$$K_b = \frac{3W}{h_0}$$

where, W – load carrying capacity, $K_b$ = bearing stiffness and $h_0$ = oil film thickness.

OR

8. a) The hydrostatic step bearing consists of six pads as shown. Neglecting the flow over corners of each pad can be approximated as a circular area of outer and inner diameter of 500 mm and 200 mm resp. The total thrust load is 900 KN and the film thickness is 0.15 mm. The viscosity and density of the oil are 30 cP and 0.9 gm/cc resp. The specific heat of the lubricant is 2.09 kJ/kg °C. If the shaft is rotating at 720 rpm, calculate : **10**

i) supply pressure ii) lubricant flow rate iii) frictional power loss iv) pumping power loss and v) temperature rise.




b) Derive an expression for flow of fluid through annular area between piston and cylinder and velocity of piston. **6**

9. a) Explain squeeze film lubrication action with examples. **6**

b) Two parallel plates 3 cm long and infinitely wide are separated by oil of viscosity 0.6 $Ns/m^2$ and are approaching each other. If a load of 30 KN per meter width is applied, what will be the film thickness after one second ? Initial film thickness is 25 $\mu$m. **6**

c) Discuss in detail, lubrication required for Cold metal working and hot metal working. **4**

OR

10. a) Derive the expression for pressure distribution, load carrying capacity and time of approach for squeeze film lubrication between parallel circular plates. **12**

    b) State the advantages and limitations of Gas lubricated bearings. **4**

11. Derive an expression for load carrying capacity of Rayleigh step bearing which has entry zone gap of $h_1$ over a length of $B_1$ and exit zone gap of $h_0$ over a length of $B_0$ and sliding with a velocity of U. **18**

$$\left[\frac{h_1}{h_0} = 1.87 \text{ and } \frac{B_1}{B_0} = 2.588\right]$$

The following data refers to the hydrodynamic tapered-pad bearing :

Length of the pad = 200 mm

Width of the pad = 850 mm

Maximum oil film thickness = 150 microns

Minimum oil film thickness = 75 microns

Viscosity of the lubricant = 0.05 Pa-sec.

Sliding velocity = 5 m/sec.

Calculate :

i) the load carrying capacity of bearing

ii) the pressure at a distance of 100 mm from leading edge

iii) coefficient of friction

iv) power lost in bearing.

OR

12. a) A fixed pad hydrodynamic thrust bearing of length 'L' and width 'B' has a fluid film shape given by relation : **8**

$$h = h_0 e^{-ax}$$

Where $h_0$ = minimum film thickness and a = constant. Assuming side leakage as zero, derive an expression for pressure distribution.

b) Give the applications of Elastohydrodynamic lubrication. **2**

c) Write short note on following (**any two**) : **8**

i) Plastic bearing materials

ii) Sintered Metal bearings

iii) Bi and Ti Metal bearings

iv) Dynamic Seals.

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**[3863] – 19**

# T.E. (Mechanical) (Semester – II) Examination, 2010
# REFRIGERATION AND AIR-CONDITIONING
# (2003 Course)

Time : 3 Hours Max. Marks : 100

***Instructions :*** *1) Answer **any three** questions from **each** Section.*
*2) Answer **three** questions from Section **I** and **three** 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, Mollier charts, elecronic pocket calculator and steam tables is **allowed**.*
*7) Assume **suitable** data, if **necessary**.*

## SECTION – I

## UNIT – I

1. a) What are limitations of reversed Carnot refrigeration system ? **4**

   b) A businessman after feasibility study found the ice consumption in a locality to be 300 kg/hr. He wants to manufacture ice at -10°C from water available at 30°C. What should be the capacity of machine in TR if it should be 10% over capacity ?

   Take $C_{pw}$ = 4.18 KJ/kg. $C_p$ of ice = 2.1 kJ/kg and latent heat of fusion of ice is 335 KJ/kg. **4**

   c) Explain with a neat sketch the reduced ambient air-refrigeration system. **8**

   OR

2. a) Explain with neat sketch thermoelectric refrigeration. **6**

   b) Explain the term “Dry air rated temperature” (DART). **4**

**P.T.O.**

c) An air refrigeration system having pressure ratio of 5 takes air at 0°C. It is compressed and then cooled to 19°C at constant pressure. If the efficiency of the compressor is 95% and that of expander is 75% Determine :

1) The refrigerating capacity of the system, if the flow of air is 75 kg/min.
2) The power required of the compressor.
3) COP of the system.

Assume compression and expansion processes to be isentropic. Take $\gamma = 1.4$, Cp = 1.005 KJ/kg. **6**

UNIT – II

3. a) Sketch the actual vapour compression cycle on P-V and T-S diagram. How does it deviate from the theoretical vapour compression cycle ? **8**

b) Compare the COP of an ammonia refrigeration cycle operates between -20°C and 30°C. in following two cases.

1) Wet compression, in which vapour leaving the compressor is dry saturated.
2) Dry Compression, in which vapour entering the compressor is dry saturated.

Assume compression to be isentropic and no sub cooling of liquid refrigerant. Take $Cp_l$ = 4.6 kJ/kgk, $C_{pv}$ = 2.8 kJ/kgk. Use following properties of refrigerant. **8**

| **Ts(°C)** | **Specific Enthalpy (KJ/kg)** | | | **Specific Entropy (kJ/kg k)** | |
|---|---|---|---|---|---|
| | **$h_f$** | **$h_{fg}$** | **$h_g$** | **$S_f$** | **$S_g$** |
| –20 | 89.8 | 1330.2 | 1420.0 | 0.3684 | 5.6244 |
| 30 | 323.1 | 1145.8 | 1468.9 | 1.2037 | 4.9842 |

OR

4. a) Write short notes on :

1) Desirable properties of ideal refrigerant for vapour compression cycle.
2) Ozone depletion and Global warming issues. **10**

b) Explain briefly Montreal Protocol and Kyoto protocol. **6**

UNIT – III

5. a) Enumerate the limitations and drawbacks of a single stage vapour compression plant required to operate between high condenser temperature and low evaporator temperature. **6**

   b) A multiload refrigeration system uses three separate evaporators E1, E2 and E3 at temperatures -10°C, 0°C and 10°C respectively. While from the condenser the refrigerant R-12 liquid is coming to the different evaporators at a temperature 40°C, the liquid from the condenser could be assumed to be saturated. The loads on evaporators E1 & E3 are 10 TR each and the load on E2 is 20TR (at 0°C). After each of the above three evaporators, separate pressure reducing valves bring the pressure to the suction pressure. Single compressor and individual expansion valves are used in the system. Make the neat flow diagram and with P-h chart find the following :

   1) Power required to run the system.

   2) COP of the system. **9**

   c) Which components of the simple vapour-absorption system replaces the compressor of a vapour compression system ? **3**

OR

6. a) Describe briefly, with neat schematic the operation of a Lithium-Bromide water absorption system. **8**

   b) Find out the generator temperature for an absorption system having evaporator and absorber temperatures as 250 K and 310 K respectively. The COP is to be 1.3. If the saturated steam is supplied at a temperature 15K above the generator temperature, what is the steam pressure. (Use steam table). **6**

   c) What is the purpose of Heat exchanger employed in Practical vapour absorption system between : **4**

   1) Generator and absorber

   2) Condenser and evaporator

SECTION – II

7. a) Explain the term "Thermodynamic wet bulb temperature". **4**

   b) Describe various methods of humidification and dehumidification of air. **4**

   c) A 2 TR cooling unit is used to dehumidify 0.2 $m^3/s$ from 28°C DBT and 25°C WBT to specific humidity level of $w_2$ = 0.08 kg of w.v./kg of d.a. Determine :
      i) DBT and DPT of air at exit condition, and
      ii) amount of dehumidification. The barometric pressure is 1.01325 bar. **8**

OR

8. a) Explain thermodynamics of human body. **4**

   b) State factors governing optimum effective temperature. **4**

   c) A drying room is to be maintained at 32°C and 30% RH. The sensible heat gain to the room is 150000 kJ/h. The moisture to be evaporated from the objects during drying is 18 kg/h. If there is no direct heat source to provide for evaporation in the room. Calculate the state and rate of supply air at 15°C DBT. **8**

9. a) Describe the procedure to estimate load on central air-conditioning system with the help of psychometric chart and block diagram. The 60% recirculated air mixes with 40 % fresh air in AHU befor cooling coil. **10**

   b) Explain air-water conditioning systems with schematic diagram. **6**

OR

10. a) Enumerate main types of compressors used in refrigeration system. Explain working of screw compressor. **8**

    b) Explain installation and charging procedure of refrigeration system. **8**

11. a) Explain “pressure losses” in duct. **6**

    b) State and explain factors involving principles of air distribution. **6**

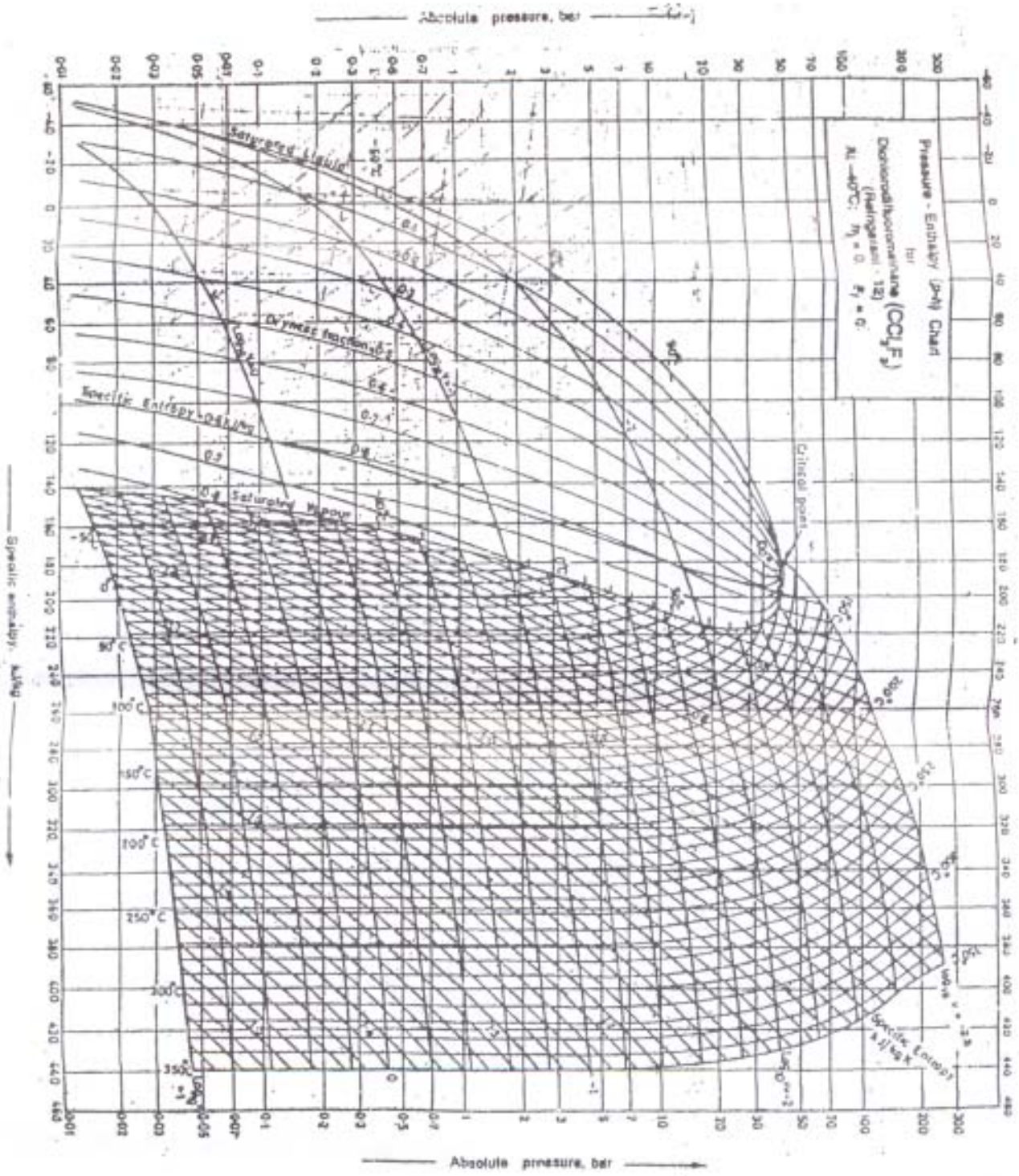
    c) State disadvantages of equal friction method and advantages of static regain method. **6**

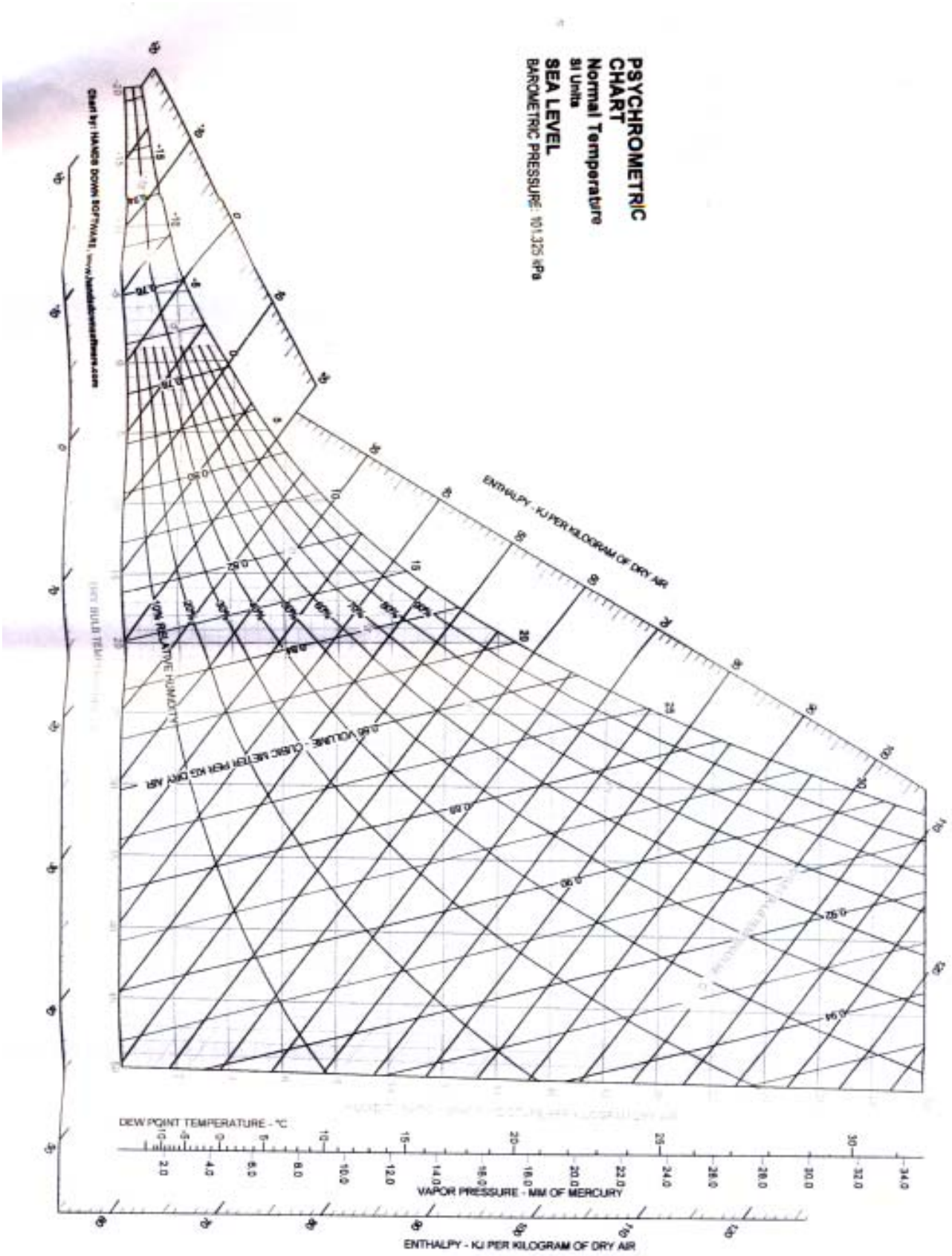
OR

12. a) What are the major causes of food spoilage ? **6**

    b) Explain the different methods of food preservation. **9**

    c) Define “food preservation”, what are the advantages of food preservation ? **3**


Absolute pressure, bar
Pressure - Enthalpy (p-h) Chart
for
Dichlorodifluoromethane ($CCl_2F_2$)
(Refrigerant - 12)
At −40°C: $h_f = 0$, $s_f = 0$
Saturated Liquid
Dryness fraction
Specific Entropy - kJ/kg K
Saturated Vapour
Critical point
Specific enthalpy - kJ/kg
Absolute pressure, bar


PSYCHROMETRIC CHART
Normal Temperature
SI Units
SEA LEVEL
BAROMETRIC PRESSURE: 101.325 kPa
ENTHALPY - KJ PER KILOGRAM OF DRY AIR
DEW POINT TEMPERATURE - °C
VAPOR PRESSURE - MM OF MERCURY
ENTHALPY - KJ PER KILOGRAM OF DRY AIR

# T.E. (Civil) (Semester – I) Examination, 2010
## FLUID MECHANICS – II

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**.*

SECTION – I

1. a) Define the terms :
   i) Drag Force ii) Lift force **(2+2)**

   b) Differentiate between :
   i) Friction drag and pressure drag
   ii) Stream-line body and bluff body. **(3+3)**

   c) Explain in detail the function, location and types of surge tank. **(2+2+4=8**

OR

2. a) Explain the phenomenon of "singing" of telephone or transmission line cables in high winds. **4**

   b) What are the different types of unsteady flow ? Give one example of each. **6**

   c) A jet plane which weights 29.00 kN and having a wing area of 20 $m^2$ flies at a velocity of 900 km/hr, when the engine delivers 7357.5 kW power. 65% of power is used to overcome the drag resistance of the wing. Calculate the coefficients of lift and drag for the wing. Take density of atmospheric air as 1.21 $kg/m^3$. **8**

3. a) Derive the expression for the force exerted by jet of water on an unsymmetrical moving curved plate when jet strikes tanngentially at one of the tips. **8**

   b) The diameter of an impeller of a centrifugal pump at inlet and outlet are 30 cm and 60 cm respectively. The velocity of flow at outlet is 2 m/s and the vanes are set back at an angle of 45°at the outlet. Determine the minimum starting speed of the pump if manometric efficiency is 70%. **6**

   c) Discuss in short cavitation in centrifugal pumps. **2**

OR

4. a) Define the following in case of centrifugal pump.

   i) Manometric efficiency ii) Mechanical efficiency

   iii) Overall efficiency iv) Manometric head **4**

   b) Explain the following :

   i) Reciprocating Pump ii) Submersible Pump **4**

   c) A jet of water of diameter 8.0 cm strikes a curved plate at its centre with a velocity of 21 m/s. The curved plate is moving with a velocity of 9.0 m/s in the direction of jet. The jet is deflected through an angle of 165°. Assuming the plate smooth find

   i) Force exerted on the plate in the direction of jet.

   ii) Power of the jet

   iii) Efficiency of the jet. **(4+2+2=8)**

5. a) Explain the following :

   i) Classification of Hydraulic Turbines

   ii) Mini and Micro hydropower plants. **8**

   b) Derive an expression for maximum hydraulic efficiency of a pelton wheel in the form

   $(\eta_h)_{max} = \frac{1}{2}(1 + k\cos\phi)$ with the usual notations. **8**

OR

6. a) An outward flow reaction turbine has internal and external diameter of runner as 0.6 m and 1.2 m respectively. The Guide blade angle is 15° and velocity of flow through the runner is constant and equal to 4.0 m/s. If the speed of the turbine is 200 r.p.m.; head on the turbine is 10 m and discharge at outlet is radial,

Determine :

i) The runner vane angles at inlet and outlet .

ii) Workdone by the water on runner per second per unit weight of water striking per second. **8**

iii) Hydraulic Efficiency.

b) Write short note on **any two** of the following : **(4+4=8)**

i) Governing of turbines

ii) Draft tube

iii) Specific speed.

SECTION – II

7. a) Derive energy equation for flow through open channel ? **4**

b) Define the following : **4**

i) Energy correction factor ii) Momentum correction factor

c) Prove the conditions of circular channel to be the most efficient channel section ? **8**

OR

8. a) Derive the expression for Chezy's formula ? Write down the relation between Manning's constant and Chezy's constant. **5**

b) Define following : **3**

i) Stage ii) Depth of flow section

iii) Top width

c) Find the velocity of flow and rate of flow of water through a rectangular channel of 8 m wide and 4 m deep, when it is running full. The channel is having bed slope as 1 in 2500.
Take value of C as 55. **4**

d) Velocity distribution in open rectangular channel is given by $V = 5y^{1/2}$. If the width of the channel is 15m and depth of flow is 2 m. Find $\alpha$ and $\beta$. **4**

9. a) Draw specific energy curve and explain different components of it. **4**

   b) Show position of hydraulic jump based on specific energy curve and specific force curve. **4**

   c) Flood discharge of 15 cubic meter per second per meter flows over a spillway and then over a horizontal concrete apron. The total head is 15 m. The flow meets with a river flow 4.5m flow depth with a hydraulic jump. Taking the loss of head over the spillway 2.0 m. and value of Mannings n as 0.014, determine the loss of energy in the jump. **10**

OR

10. a) Derive criterion for flow to be critical flow. **6**

    b) What do you mean by hydraulic jump ? Starting from first principle derive the expression for loss of energy due to hydraulic jump in the form of pre-jump and post jump depth. **6**

    c) A rectangular channel 5m wide conveys 15 cub.m/sec at a depth of 2 m.
       i) What is critical depth ?
       ii) Which type of flow is there ?
       iii) What is Froude number of the flow ?
       iv) What is specific energy ?
       v) Is the slope is mild or steep ?
       vi) If mannings n is 0.014, what slope would be required ? **6**

11. a) Discuss the characteristics of $C_3$ profile and state its occurrence. Sketch different water surface profiles when the flow takes place from a steep slope to critical slope. **4**

    b) A rectangular channel 15 m wide carries a discharge with a normal depth of 3m. The bed slope of the channel is 1 in 3000. If at a certain section, the depth of flow is to be raised to 2.5 m by constructing a weir across a channel, determine how far upstream of this section the depth of flow would be in 10% of the normal depth. Use step by step method and take only one step. Assume n tobe 0.012. Classify and sketch the profile. **12**

OR

12. a) Explain Ven Tee Chow method of GVF computations. **8**

    b) Flow in a 6 m wide rectangular concrete channel drops in the depth from 1.6 to 1.2 m in a length of 100 m. If the bed slope is 0.001. Find the theoretical rate of flow in the channel. Take n = 0.014. **8**

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**[3863] – 20B**

# T.E. (Mechanical Mech. S/ W) (Semester – II) Examination, 2010
## (1997 Course) (Old)
## APPLIED THERMODYNAMICS – 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** necesary.*
*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 : Available and unavailable energy. **6**

   b) What are the reasons of irreversibility ? **4**

   c) A cylinder of I.C. Engine contains 2450 $cm^3$ of gaseous combustion products at a pressure of 7 bar and a temperature of 867°C just before the exhaust valve opens. Determine the specific energy of the gas in kJ/kg. Ignore the effects of motion and gravity and model the combustion products as an ideal gas. Take $T_0$ = 300 k and $P_0$ = 1.013 bar. **6**

2. a) Define 'one ton refrigeration'. **3**

   b) With the help of p-V and T-S diagram, explain working of Bell Colemn cycles and derive expression for COP. **7**

   c) Air enters the compressor of an ideal Brayton refrigeration cycle at 1 bar, 270°K with a volumetric flow rate of 1.4 $m^3/s$. If the compression pressure ratio is 3 and the turbine inlet temperature is 300 k, determine : (a) the net power output in kW (b) refrigeration capacity in kW (c) COP. **6**

3. a) Explain stages of combustion of S.I. engine. **6**

   b) Explain pre-ignition and detonation. **6**

   c) Explain any one combustion chamber of S.I. engine. **4**

**P.T.O.**

4. a) What is the need for superchanging ? **4**
   b) What are the limitations at super charging in C.I and S.I. engines ? **6**
   c) Explain any one super charger with neat sketch. **6**

5. Write notes on **any three** of the following : **18**
   a) Stages of combustion of C.I. engine.
   b) Combustion chambers of C.I. engine
   c) Vapour absorption refrigeration.
   d) Desirable properties of refrigerants.

SECTION – II

6. a) Define : PPT, $\mu$ ,$\phi$,RH. **6**
   b) Compare : Central and unitary air conditioning system. **6**
   c) Write applications of air conditioning. **4**

7. a) Compare : Rotary and reciprocating compressors. **6**
   b) Explain : Surging and choking. **6**
   c) Write a note on ‘selection of compressors’. **4**

8. a) What are the alternative fuels for I.C. engines ? **4**
   b) What are the important qualities of S.I. engine fuels ? **4**
   c) Define : Flast point, Fire point. **4**
   d) Write a note on crude petroleum refining. **4**

9. a) Explain emissions from diesel engines. **6**
   b) Explain catalytic convertor with a neat sketch. **6**
   c) Write a note on ‘Emission norms for 2000 in India’. **4**

10. Write notes on **any three** of the following :
    a) Positive displacement compressors.
    b) Stalling of rotodynamic compressor.
    c) Important qualities of C.I. engine fuels
    d) Emissions from S.I. engines. **18**

**[3863] – 21**

# T.E. (Mechanical Sandwich) (Semester – I) Examination, 2010
## Elective – I : 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) Why residual stresses came during welding process ? Explain how to minimise it. **8**

   b) Explain the characteristics of arc welding, Viz constant current and constant voltage. Give the application of each. **8**

OR

2. a) Explain the importance of Edge preparation, cleaning of edges, tack welding in welding process. **8**

   b) Explain how metal transfer take place in arc welding. **8**

**UNIT – II**

3. a) What is meant by welding electrode ? Classify the Welding electrode. Write down the selection of electrode for a particular application. **9**

   b) Compare the Electro slag welding with that of submerged arc welding with respect to the heat liberation, electrode welding position and application. **9**

OR

4. a) Explain the method of obtaining a weld in horizontal position by submerged metal arc welding (SMWA) process. **9**

   b) Explain with neat sketch the Plasma arc welding and compare torch tip of plasma
   arc process with TIG welding process. **9**

**UNIT – III**

5. a) What is soldering and brazing ? Compare these two processes with respect to process temperature, flux material, joint design and filler material. **8**

   b) What is oxy fuel cutting ? How it affects properties of welded metal ? **8**

OR

6. a) Explain any two brazing process. **8**

   b) Suggest a suitable process and explain it for welding of plain carbon steel. **8**

SECTION – II

**UNIT – IV**

7. a) Discuss the variable in resistance welding process that are controlled. How dissimilar metals are welded by resistance welding ? **7**

   b) Suggest a suitable gas flame used for welding of following material and draw sketch and justify it.

      i) Stainless steel,

      ii) Zinc base metal,

      iii) Aluminium. **9**

OR

8. a) Explain resistance spot welding cycle. Also explain the seam resistance Welding process. **8**

   b) Write a short note on

      i) atomic hydrogen welding,

      ii) seam welding. **8**

**UNIT – V**

9. a) With neat sketch explain electro beam welding and comment on metallurgical aspect of electro beam welding. **9**

   b) Explain the explosive welding ? State their advantage, limitation, application. **9**

OR

10. a) What is meant by ultra sonic welding ? Explain the factors affecting quality of ultra sonic welding. **9**

    b) Explain in short two techniques for lap and butt-welding ? **9**

**UNIT – VI**

11. a) Explain four defects in welding along with their remedies ? **8**

    b) Write note on :

    i) Magnetic particle inspection

    ii) I.S. Codes for welding. **8**

OR

12. a) Write note on :

    i) welding cost,

    ii) welding fixture. **8**

    b) Why non destructive testing is carried out for a welded parts ? Explain fluorescent penetrate test. **8**

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**[3863] – 24**

# T. E. (Mechanical S/W) (Semester – I) Examination, 2010
# PLANT ENGINEERING (Elective – I)
# (2003 Course)

Time : 3 Hours Max. Marks : 100

***N.B. :*** *1)* ***All*** *questions are* ***compulsory****.*
*2) Assume suitable data if* ***necessary****.*

SECTION – I

1. a) Explain different types of layouts. Write the difference between the product layout and process layout. **10**

   b) Explain the concept of flow and explain different types of flow. **6**

   OR

   a) Explain the advantages and disadvantages of different types of layout . **10**

   b) Explain in short fixed position layout. **6**

2. a) Explain the different factors affecting site selection. **8**

   b) Explain systematic layout analysis. **8**

   OR

2. a) Explain REL chart. **8**

   b) Explain PQRST Analysis. **8**

3. a) Explain the different types of material handling equipment. **8**

   b) Explain concept of AGV and unit load concept. **10**

   OR

   a) Explain the product life cycle concept. **8**

   b) Explain computerized maintenance and housekeeping. **10**

**P.T.O.**

SECTION – II

4. a) Explain safety criteria against chemical hazards, mechanical hazards. **10**

   b) Explain accident prevention practices. **6**

   OR

   a) Explain different methods of waste disposal. **8**

   b) Explain the estimation of capacity for auxiliary services like water, steam, and power compressed air. **8**

5. a) Explain the equilibrium theory of workpiece control. **8**

   b) Explain the concepts of systems engineering. **8**

   OR

5. Explain workpiece control system. **16**

6. a) Explain PFA Analysis. **8**

   b) Explain CRAFT and CORELAP location of new plant equipment in an existing plant. **10**

   OR

   a) Explain the performance modelling. **8**

   b) Explain bathtub curve on the basis of failure rate and hazards rate. **10**

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**[3863] – 27**

# T.E. (Mechanical-Sandwich) (Semester – II) Examination, 2010
## 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) Mechatronics is the synergistic integration of mechanical engineering with electronics and control engineering for the design and manufacturing product. Justify the statement. **6**

   b) Compare the characteristics of an orifice meter, electromagnetic flow meter and ultrasonic flow meter. **6**

   c) Discuss how thermocouple vacuum gauge is used in pressure measurement. **6**

   OR

2. a) Describe the characteristics parameter used in transducers. **6**

   b) What is meant by the term “real- time mechatronics systems” ? **6**

   c) Explain analogy between Ohm’s law and flow of liquid through a resistors. **6**

3. a) Explain briefly the working principle of push-pull displacement sensor with neat diagram. **6**

   b) How do Hall effect sensors differ from photoelectric sensors ? **6**

   c) Explain how liquid-level sensor are digitalized to obtain the required output with high precision. **4**

   OR

4. a) Suggest the method used in measuring torque in I.C. Engines and discuss how this method differs from other method. **6**

   b) Explain temperature compensation technique used in strain gauge circuits. **6**

   c) Write short note on infrared pyrometer. **4**

5. a) Write an equation for the relationship between applied torque and angular velocity for a viscous damper in which both shafts are free to rotate. **6**

   b) Define transfer function. State the properties of a transfer function. **6**

   c) Explain feedback control system with example. **4**

OR

6. a) Write differential equation for the mechanical systems. **8**

I)

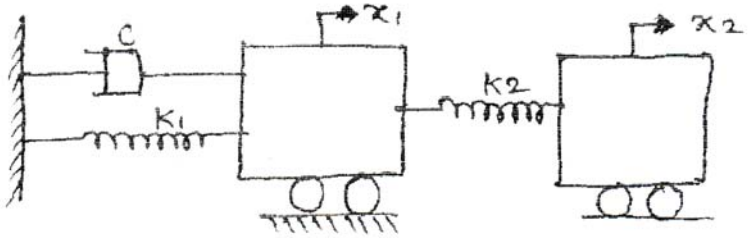


fig. I (a)

II)

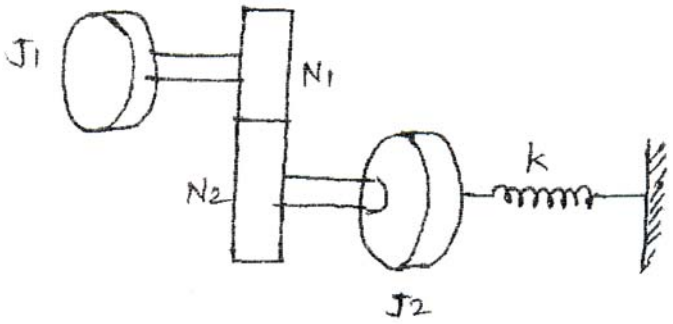


fig. II (a)

b) An air heating system is shown in fig. I(b). Assume that the heat loss to the surroundings and heat capacitance of metal part of the heater are negligible, obtain transfer function. **4**

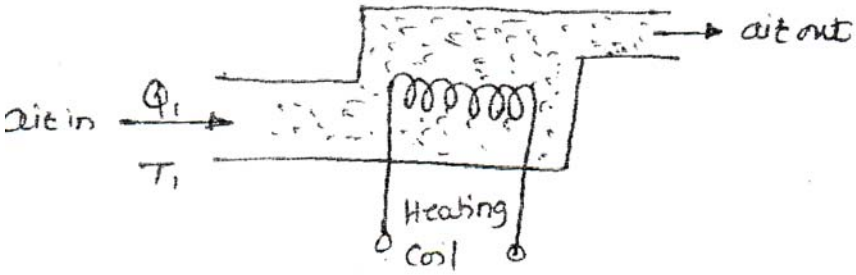


fig I(6)

c) Explain feedforward control system with example. **4**

SECTION – II

7. a) Give the relationship between the static error constants and the steady state errors for step ramp and parabolic input. **6**

b) Explain Relays and its characteristics. **6**

c) State components of electro pneumatic system. **4**

OR

8. a) Explain the concept of stability and relative stability. Give at least two conditions for astable control system. **6**

b) Explain time response of second-order system to a unit step input. **6**

c) What are the main advantages of a PID controller ? **4**

9. a) How are discrete signals different from analog signals ? **4**

b) Explain Monostable 555 multivibrator. **6**

c) Explain the various operations performed by a signal conditioner. **6**

OR

10. a) How does A/D handle the sign of input signal ? **4**

    b) Explain three types of logic gates using symbols and truth table. **6**

    c) What is function of a protection circuit ? Explain any two types of this circuit. **6**

11. a) Explain the use of internal relays in PLC's with the help of suitable example. **6**

    b) Write in short on 'counters' in PLC's. **4**

    c) Develop a ladder diagram for the following :

    A motor started with the START button which is No. The motor can be stopped by pressing STOP button which is Ne. A thermal overload switch is provided which open on high temperature. A green light is on while the motor is running. When three is thermal overload the motor is put off and the red light indicating the thermal overload is put ON. **8**

OR

12. a) With the help of block diagram explain basic structure of programmable logical controller. **6**

    b) What are the advantages of PLC over a relay control system ? **4**

    c) Develop a ladder diagram for the following

    A small electrical furnace has a two heating elements that are energized in two stage, 5 minutes apart that is when the furnace is turned ON, the first heating element comes on right away, and second heating element comes on 7 minutes later. A temperature switch will shutdown the furnace if it gets too hot. Draw ladder diagram for control circuit. **8**

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**[3863] – 27A**

# T.E. (Mechanical S/W) (Semester – II) Examination, 2010
## PRODUCTION ENGINEERING
## (1997 Course) (Old)

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**.*

SECTION – I

1. a) A tubing of 40 mm outside diameter is turned on a lathe at a cutting speed of 20 m/min and feed 0.5 mm/rev, the rake angle of tool is 25°. The cutting force is 400 N and feed force is 150 N. The length of continuous chip in one revolution is 50 mm, calculate -
   i) Chip thickness ratio ii) Chip thickness
   iii) Shear plane angle iv) Coefficient of friction. **8**

   b) Sketch single point cutting tool showing its geometry. **5**

   c) Explain the procedure for force measurement in turning operation. **5**

2. a) Explain the broach geometry with neat sketch. **8**

   b) Explain the gear hobbing process with neat sketch. **8**

3. a) Explain different methods of generation of threads on workpiece. **8**

   b) Explain compression and blow moulding process for plastics. **8**

4. a) Explain electroplating process along with its applications. **6**

   b) Differentiate between hand tapping and machine taping. **6**

   c) Draw sketch for bevel gear generation process. **4**

**P.T.O.**

SECTION – II

5. a) List the reasons for need of non conventional machining processes. **5**

   b) Explain EDM with schematic diagram along with its advantages and applications. **8**

   c) Discuss the procedure of preparing the process sheet. **5**

6. a) Write short notes on i) Machining centers ii) FMS. **8**

   b) Mention the advantages of NC machines over conventional one. **4**

   c) Explain following codes. i) G 91 ii) G 84 iii) M05 iv) M08. **4**

7. a) Explain the following sheet metal working operations (**any four**) **8**

      i) Piercing ii) Notching iii) Forming iv) Coining v) Drawing

   b) Explain with neat sketch (**any four**) wrt press working. **8**

      i) Bolster plate ii) Die block iii) Punch Plate

      iv) Shut height v) Guide post.

8. a) For jig design, explain the following locating devices : **9**

      i) Locating pins ii) Supporting pins iii) Jack pins

   b) Explain essential features of milling fixtures. **5**

   c) What is fool-proofing in jig/fixture design ? **2**

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**[3863] – 31**

# T.E. (Production Engineering) (Semester – I) Examination, 2010
# MATERIAL SCIENCE AND COMPOSITE MATERIALS
# (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.***

*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.*

## SECTION – I

1. a) Draw Fe-C equilibrium diagram and label the temperatures, composition and phases. **8**

   b) Describe electrolytic polishing and etching of specimens. State its advantages and disadvantages. **8**

OR

2. a) Explain the following with neat diagrams. **8**

   i) Eutectoid transformation

   ii) Peritectic transformation

   b) Explain with suitable graph, how mechanical properties of plain carbon steel vary with % C. **8**

3. a) Describe the cooling of 0.4 % C steel from austenitic region to room temperature. **8**

   b) Explain Jominy end quench Hardenability test. **6**

   c) Write the purpose of heat treatment of steel. **4**

OR

**P.T.O.**

4. a) Explain the procedure for plotting a TTT diagram for eutectoid steel and draw the curve for the same. **8**

   b) Differentiate between annealing and normalising of steel also draw the neat sketch. **6**

   c) What is retained austenite ? Why it is not desirable ? **4**

5. a) What is carburizing ? Explain heat treatment after carburizing. **8**

   b) Write short note on flame hardening. **8**

OR

6. a) Explain the nitriding with its advantages and disadvantages. **8**

   b) Write short note on **8**

      i) Austempering

      ii) Ausforming

SECTION – II

7. a) What are different types of cast iron ? Explain with its applications. **8**

   b) Write short note on heat treatment of cast iron. **6**

   c) Draw the typical microstructure of Grey Cast Iron. **4**

OR

8. a) What are the advantages of alloy steel over plain carbon steel ? **6**

   b) What are the types of stainless steels ? Explain with its chemical composition and application. **8**

   c) Explain sensitization of stainless steel. **4**

9. a) Give typical composition and use of following **(any four)** : **8**

      i) Babbits

      ii) Gun metal

      iii) Invar

      iv) German silver

      v) LMZ

b) What is season cracking ? How it is avoided ? **4**

c) What are the requirements of bearing material ? **4**

OR

10. a) Draw equilibrium diagram of Cu-Zn. **6**

b) What is equivalence zinc in brass ? Explain its significance. **6**

c) Describe the effect of increase in zn content on properties of brass. **4**

11. a) What is composite material ? What unique properties they have over conventional material ? Explain with suitable example. **6**

b) What is aspect ratio ? Explain effect of fibre length on Tensile strength of composite. **6**

c) How carbon Fibres are produced ? **4**

OR

12. a) What is metal matrix composite ? Explain with suitable example. **8**

b) What is nano material ? Give any one application and composition of Nano material. **8**

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**[3863] – 32**

# T.E. (Production/Production S/W) (Semester – I) Examination, 2010
# KINEMATICS AND DESIGN OF MANUFACTURING MACHINES
# (2003 Course)

Time : 4 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) Synthesize a four bar mechanism to generate a function $y = x^3 + 3x$ for $1 \leq x \leq 5$ at three precision points. Assume initial crank angle as 30° with an interval of 90° and initial rocker arm angle 40° with an interval of 60°. Assume length of fixed link as 50 mm. **8**

   b) Explain with neat sketch the kinematic analysis of gear shaping machine. **8**

OR

2. a) Derive equations for angular velocity of coupler link and drag link in case of given four mechanism. **10**

   b) Write the kinematic balance equation for : **6**

      i) Screw and nut mechanism

      ii) Rack and pinion

      iii) Worm and worm wheel.

**P.T.O.**

3. a) A machine member is made of plain carbon steel of ultimate strength 620 MPa and endurance limit 276 MPa. If this member is subjected to overstress tuned to 413 MPa for 3000 cycles, determine the revised fatigue limit using miner's rule. **10**

   b) Draw fatigue curve and discuss its importance in design of machine elements. **6**

OR

4. a) A machine component is subjected to two dimensional stress. The tensile stress in X-direction varies from 40 to 100 MPa while tensile stress in Y-direction varies from 10 to 80 MPa. The corrected endurance limit of the component is 270 MPa. The ultimate tensile stress is 660 MPa. Determine the factor of safety. **16**

5. a) A spur gear is required to transmit 10 KW Power. The speed of driving motor is 400 rpm and driven machine is 200 rpm. The approximate centre distance between the gear is 600 mm. The teeth have 20° full depth involute profile. Assume following data :

   Allowable strength of gear material = 75 MPa

   Profile error (e) = 0.05 mm.

   $$y = 0.154 - \frac{0.912}{z}$$

   where z = no. of teeth on pinion.

   Determine the number of teeth on gear and pinion. **10**

   b) Derive an expression for formative number of teeth of helical gear. **8**

OR

6. a) Derive an expression for wear strength of spur gear. **10**

   b) Explain with neat sketch terminology of helical gear. **8**

SECTION – II

7. a) A 75 mm diameter shaft is to be supported at ends. It operates continuously for 8 hrs/day, 300 days/year for 10 years. The load and speed cycle for the bearing is given below :

| S.N. | Fraction of Cycle | Radial load (N) | Thrust load (N) | Speed (rpm) |
|---|---|---|---|---|
| **1** | 0.25 | 3500 | 2000 | 1000 |
| **2** | 0.25 | 2500 | 2000 | 1500 |
| **3** | 0.50 | 4000 | 2000 | 800 |

Service factor = 1.5, Radial load factor = 0.56, Axial load factor = 1.99. Inner race rotates. Calculate dynamic load capacity of the bearing. **8**

b) Define the following terms : **8**

i) Eccentricity ratio

ii) Clearence

iii) Attitude angle

iv) Bearing characteristics.

OR

8. a) Why taper roller bearing are preffered over cylindrical roller bearings ? **4**

b) Explain following terms :

i) Rated life

ii) Basic load rating

iii) Dynamic load. **6**

c) Describe various steps in design of Journal bearings. **6**

9. a) In a punching operation 20 holes of diameter 25 mm are punched per hour in a plate of thickness 10 mm. Shear resistance of plate material is 300 MPa. Mean diameter of flywheel rim = 1 m, coefficient of speed fluctuation is 0.1. The actual punching operation takes 25% of the cycle time. The force displacement curve is assumed to be triangular in shape. Mass density of Flywheel material is 7100 Kg/$m^3$. Calculate the dimension of Flywheel rim if rim contributes to 90% of the required moment of inertia. **10**

   b) What are design considerations for welded parts ? **6**

OR

10. a) Explain importance of ergonomic factors in design. **8**

    b) Describe type of stresses produced in i) Flywheel rim and ii) Flywheel arms. **8**

11. a) Formulate the optimization model to design gear pair for minimum weight which can transmit 5 KW at 1000 rpm with velocity ratio 3. **10**

    b) Draw neat sketch of normal curve and write its equation in terms of standard variables. **8**

OR

12. a) Explain with suitable example, the method of optimum design for redundant specification. **10**

    b) A bearing has normally distributed time to failure with a mean of 10000 hr. and standard deviation of 750 hr. If there are 100 such bearings fitted at a time, how many are expected to fail within first 11000 hr. The areas under standard normal distribution curve are as below :

| **Z** | **1.0** | **1.1** | **1.2** | **1.3** | **1.4** | **1.5** | **1.6** |
|---|---|---|---|---|---|---|---|
| **Area** | 0.3413 | 0.3643 | 0.3849 | 0.4032 | 0.4192 | 0.4332 | 0.4452 |

Use linear interpolation for values in between. **8**

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**[3863] – 33**

# T.E. (Production/Produ. S/W) (Semester – I) Examination, 2010
# MATERIAL FORMING (2003 Course)

Time : 3 Hours Max. Marks : 100

***Instructions**:1) Answer **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.*
*5) Use of logrithmic 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 differentiate between hot forming and cold forming . **8**
   b) Explain 'Cam plastometer' with neat sketch. **8**

OR

2. a) Explain various factors affecting plastic deformation. **8**
   b) Derive the equation for 'elastic work done' and plastic workdone. **8**

## Unit – II

3. Derive an equation for maximum pressure for axisymmetric forging (Circular disc) considering sticking friction. **18**

OR

4. a) Explain the advantages of forging over casting. **6**
   b) Explain double acting steam hammer with neat sketch. **6**
   c) Explain 'Machine forging' with neat sketch. **6**

## Unit – III

5. a) Derive an equation for total drawing stress in wire drawing operation considering friction at die land. **12**
   b) Explain 'Rotary swaging' **4**

OR

6. a) Explain stock preparation required before wire drawing operation. **10**
   b) Explain wire drawing die with neat sketch. **6**

SECTION – II

**Unit – IV**

7. a) Explain various types of series used in roll pass sequence. Give a proper roll pass sequence for angle section. **10**
   b) Explain the following : **6**
      i) Mill spring
      ii) 'Ragging' in rolling
      iii) Forward and Backward slip.

OR

8. a) Explain 'AGC' and state various methods of AGC. **8**
   b) Explain 'Sendzimir' mill and 'Planetary mill' with neat sketch. **8**

**Unit – V**

9. a) Explain and differentiate between 'Forward' extrusion and 'Backward' extrusion. **8**
   b) Explain 'Impact extrusion' and 'Hooker's process' with neat sketch. **8**

OR

10. a) Explain and differentiate between 'Direct' and 'Indirect' extrusion. **8**
    b) Explain various factors that affect extrusion pressure. **8**

**Unit – VI**

11. a) Explain 'Electro-hydraulic forming' with neat sketch. **9**
    b) Explain 'Electro-magnetic forming' with neat sketch. **9**

OR

12. Write short note on : **18**
    i) Metal spinning
    ii) HERF
    iii) Stretch forming.

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**[3863] – 34**

# T.E. (Production) (Semester – I) Examination, 2010
# PRODUCTION PLANNING AND CONTROL
# (2003 Course)

Time : 3 Hours Max. Marks : 100

***Instructions**: 1) Answer **any three** 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) Your answers will be valued as a whole.*
*7) **Use** of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is **allowed**.*
*8) Assume suitable data, if **necessary**.*

SECTION – I

## Unit – I

1. a) Explain, what information is to be collected by production manager for an efficient production planning ? **8**

   b) Explain what is batch type production system. **8**

OR

2. a) Explain an integrated approach towards PPC function. **8**

   b) Explain briefly the relationship of Production Planning and Control (PPC) with other departments. **8**

## Unit – II

3. a) How forecasting methods are classified ? Explain any two methods in brief. **9**

   b) There is a correlation between population of the city and Santro $I^{20}$ model sold.

This relation is shown in the following table :

| **Population in lakhs** | 5 | 9 | 11 | 14 | 18 | 21 |
|---|---|---|---|---|---|---|
| **Number of Santro $I^{20}$ sold x 1000** | 29 | 41 | 66 | 82 | 97 | 128 |

Estimate the sales of Santro $I^{20}$ with city population 30 and 35 lakhs. **9**

OR

4. a) Explain the different steps involved in sales forecasting process ? What are the requirements of good forecasting method ? **9**

   b) Enumerate different judgemental techniques used for sales forecasting. Explain minimum four techniques in brief. **9**

## Unit – III

5. a) Explain what is process planning ? What are the different factors considered in selection of process and equipments. **8**

   b) What are activities associated with process planning ? Explain steps involved in process planning. **8**

OR

6. a) Explain following terms used in assembly line balance : **8**

   i) Precedence diagram

   ii) Desired cycle time

   iii) Theoretical number of work stations

   iv) Efficiency and balance delay.

   b) Explain use of Gantt chart is process planning with suitable example. **8**

SECTION – II

**Unit – IV**

7. a) Explain the difference between MRP-I and MRP-II. Briefly explain MRP-I. **8**

   b) Explain the different aspects in make or buy decisions. **8**

OR

8. a) What is ERP ? Explain benefits of ERP user. **8**

   b) Explain with block diagram flow of information in CRP. **8**

**Unit – V**

9. a) Explain different costs associated with inventory. **9**

   b) The annual demand for a component is 9000 units. The carrying cost is Rs. 60/- unit/year, the ordering cost is Rs. 50/- per order and the shortage cost is Rs. 70/- unit/year.

   Find the optimal values of the following :

   i) Order quantity. **2**

   ii) Cycle time. **2**

   iii) Maximum level. **2**

   iv) Represent Graphically. **3**

OR

10. a) Define inventory. How inventories are classified ? Why inventories are kept in industry ? **9**

    b) A material manager adopts the policy to replace an order for minimum quantity

of 1800 of a particular item in order to avail discount of 17%. It was found from the company record that for last 4 orders were placed each of size 450 nos., ordering cost is Rs. 220 per order. Inventory carrying charges at 20 percent and cost per unit is Rs. 275/-.

Is the purchase manager justified in his decision ? What is the effect of this decision on the company ? **9**

## Unit – VI

11. a) Define waste, scrap, obsolete and surplus material. Why these are arising in industries ? **8**

    b) What are the different sources of manufacturing wastes as identified in the JIT ? **8**

OR

12. a) Explain different to the industries by applying JIT. **8**

    b) What are different methods of stock taking ? Why industries has to go for stock taking ? **8**

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**[3863] – 37**

# T.E. (Production/Prod. S/W) (Semester – II) Examination, 2010
## MANUFACTURING PROCESSES – II
## (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) **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 – I

1. a) Mention various welding parameters in SAW and explain their effect on quality of welding in SAW. **8**

   b) State the various types of shielding gases used in GMAW. State their characteristics. Mention which shielding gases are used in welding of any two materials of your choice. **8**

OR

1. a) Explain non conductor fennule method and semiconductor cartridge method with neat sketch in steel welding. **8**

   b) Explain with neat sketch how the metal get transferred from electrode during short circuit or dip transfer in MIG welding processes. **8**

2. a) Describe oxy-acetylene gas welding technique. Name various fuel gases used in it. **8**

   b) Explain projection welding process with neat sketch. Mention the controllable parameters in projection welding. **8**

OR

2. a) Describe the principle of oxy-fuel gas cutting. What is meant by 'kerf' and 'drag' in gas cutting ? **8**

   b) Differentiate between flash welding and upset welding. **8**

3. a) Compare EBW with LBW. **6**

   b) Write short notes on -Friction welding, Ultrasonic welding. **12**

OR

3. a) Explain with neat sketch a thermit welding process along with advantages and limitations. **9**

   b) Distinguish brazing from soldering. What are fluxes and filler metals used in both and write down their function ? **9**

SECTION – II

4. a) Explain design considerations in casting. **8**

   b) What is the ideal profile of a sprue ? What are the criteria to be used for designing the pouring basin. **8**

OR

4. a) Define 'gating ratio'. Explain pressurised and non pressurised gating system with reference to applications. **8**

   b) What are various casting defects ? Give their causes and remedies. **8**

5. a) Discuss various methods of thread manufacturing. **8**

   b) Classify gear manufacturing methods, explain gear shaping process with neat sketch. **8**

OR

5. a) Discuss gear grinding process in detail. **8**

b) Explain how thread milling with a single cutter and multiple cutter is performed. **8**

6. a) Enlist the requirements that demands use of non-traditional machining process. **6**

b) Explain the basic mechanism of material removal in USM. **6**

c) What is over cutting in EDM process ? What is its reason ? How it is minimised ? **6**

OR

6. a) Explain the working principle of EBM process. **6**

b) In electrochemical machining of iron, it is desired to obtain a metal removal rate of 5 $cm^3$/min. Determine the amount of current required for the process, with following parameters.

atomic weight of iron – 56 gms

valancy – 2

density – 7.8 $gm/cm^3$

Faraday's constant – 1609 amp-min. **6**

c) Write a short note on Electrochemical Grinding. **6**

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# T.E. (Production/Production S/W) (Semester – II) Examination, 2010
## DIE AND MOULD DESIGN
## (2003 Course)

Time: 4 Hours Max. Marks: 100

***Instructions :*** *i) From Section **I** solve, Q. **1** or Q.**2**, Q.**3** or Q. **4**, Q.**5** or Q.**6**, and from Section **II** solve Q.**7** or Q.**8**, Q.**9** or Q.**10**, Q.**11** or Q.12.*

*ii) Answers to the **two** Sections should be written in **separate** answer book.*

*iii) **Neat** diagrams must be drawn **wherever** 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. Design a blanking die for the component shown in Figure.1.

i) Draw strip layout and find out material utilization. **4**

ii) How cutting force is reduces ? Find out press tonnage with full shear. **4**

iii) Design blanking die and draw the same. **4**

iv) Draw neat sketch of press tool. **6**

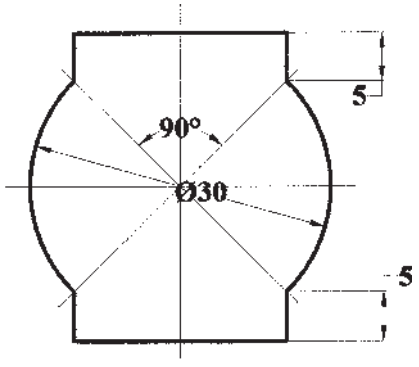



**Fig. 1:Blank of m.s. sheet 1mm thk with shear stress =400N/mm$^2$**

OR

2. Design a progressive die for the component shown in Figure 2.
   Given : Stock thickness = 2mm, Shear strength of material = 195 MPa.
   i) Draw best strip layout and find material utilization **4**
   ii) Find press tonnage **4**
   iii) Design and draw pilot and show its mounting **4**
   iv) Draw assembly drawing **6**

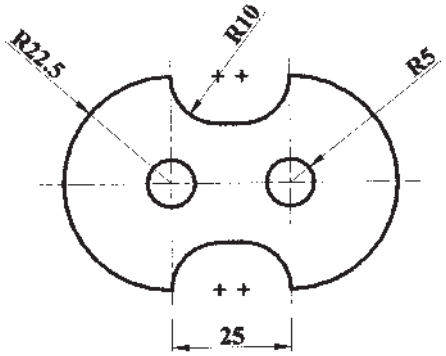



**Fig: 2**
**Material: Al, 2mm thick**

3. Design a drawing die for the shell shown in fig.3 drawn from CRC sheet of 0.8 mm thickness and UTS = 240N/mm$^2$. **16**
   Determine :
   i) Blank Size
   ii) Number of draws
   iii) Dimension of die and punch and assembly drawing for each draw
   iv) Force required for each draw.

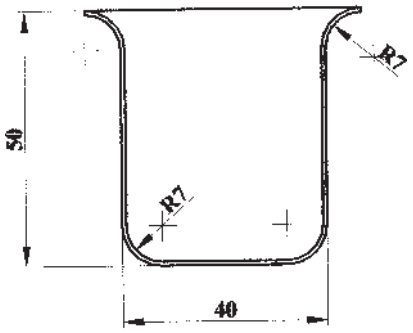



**Fig: 3**

OR

4. a) Find out the developed length of the component shown in fig. 4. **6**

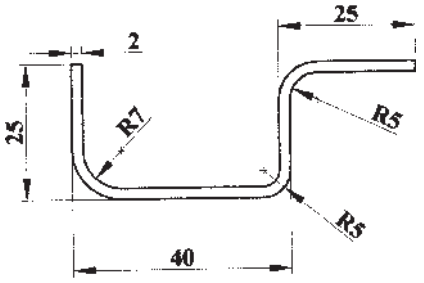



**Fig: 4**

b) What are the methods of reducing spring back and which would be used for the component in fig.4 ? **5**

c) Draw assembly drawing of bending die. **5**

5. a) What is edging ? And design edging impression for the component in fig.5. **6**

b) How stock size is calculated ? Find out it for the given problem. **4**

c) Which factors are considered in designing finish impression ? Draw neat sketch of finish impression. **6**

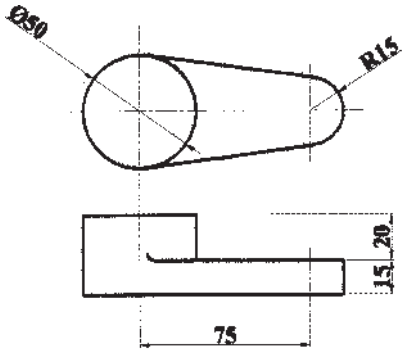



**Fig. 5: Close die forging job**

OR

6. Explain the basic rules for upset die design with the help of component shown in fig.6. **16**

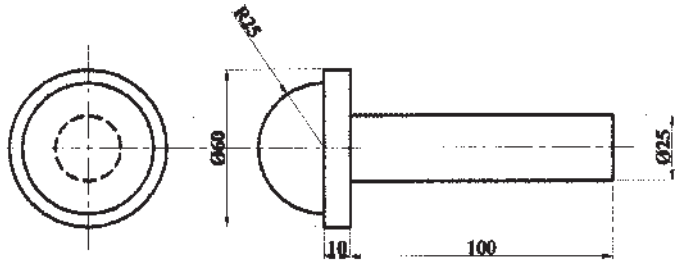



**Fig. 6: Upsetting job**

SECTION – II

7. a) Explain die locking methods in die casting with suitable sketch. **8**

   b) Explain with neat sketch die terminology in die casting. **8**

OR

8. a) Explain with neat sketch ejection system in die-casting. **8**

   b) Explain gooseneck hot chamber die casting with neat diagram. **8**

9. a) What are the functions of guide pillar and guide bush ? Explain its different types. **8**

   b) Explain cavity and core insert with neat sketch and also explain its method of fitting to bolster. **8**

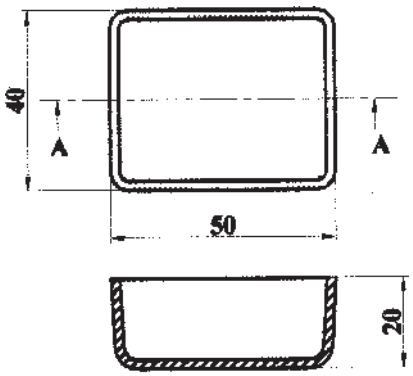
OR

10. Explain with neat sketch : **16**

    i) Blow moulding ii) Thermoforming

    iii) Injection moulding for thermosetting.

11. Design an injection mold for the PVC component shown in figure 7. **18**




**Sec A-A**

**Fig: 7**

OR

12. a) Explain any two types for ejector plate return system. **8**

    b) What is stop pin in injection moulding ? **2**

    c) What rectangular edge gate and 50 mm long runner dimensions are required for moulding PVC box the dimension of which is as follows ?
    Length = 150 mm; width = 130 mm; depth = 50 mm.
    Given : PVC constant(n) = 0.9; PVC density = 1.39 gm/cm$^3$. **8**

**[3863] – 4**

# T.E. Civil (Sem. – I) Examination, 2010
# GEOTECHNICAL ENGINEERING (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) What are the major soil deposits of India ? Explain any two in brief. **6**

   b) Draw plasticity chart and also explain how fine grained soils are classified with plasticity chart. **6**

   c) The grading curve of a soil gives effective size as 0.16 mm. $D_{30}$ = 0.4 mm and $D_{60}$ = 0.8 mm, find Cu and Cc. Classify the soil. **6**

OR

2. a) Draw a three phase diagram and define degree saturation porosity, air content. **6**

   b) What is specific gravity of soil ? How it is determined in the Laboratory ? **6**

   c) Draw particle size distribution curve for Uniformly graded soil and Gap graded soil. **6**

3. a) Derive the expression for coefficient of permeability for variable head test. **5**

   b) What is flow net ? What are the properties of flow net ? **5**

   c) A soil profile consists of three layers of thickness equal to 2 m, 4 m and 6 m with coefficient of permeability equal to $2\times10^{-4}$ cm/sec, $3.5\times10^{-5}$ cm/sec and $1.5\times10^{-3}$ cm/sec. Find the equivalent coefficient of permeability, when the flow is parallel to the layers. **6**

OR

4. a) Define the terms : Gravitational water, Held water, structural water, and hygroscopic water. **5**

   b) What are the factors affecting the permeability of a soil ? **5**

   c) In order to compute the seepage loss through the foundation of a coffer dam. How nets were constructed ? The result of the flow net gave. $N_f = 6$ and $N_d = 16$. The head loss during seepage was 10.0 m. If the coefficient of permeability of soil $K = 4\times10^{-5}$ M/min. Compute the seepage loss per meter length of dam per day. **6**

5. a) Explain standard proctor test. How MDD and OMC are determined with this test ? **6**

   b) Explain the concept of pressure bulb. What is its significance ? **5**

   c) Write a short note on " Proctor needle in field compaction control." **5**

OR

6. a) What are the factors affecting compaction of soil ? **5**

   b) Write the equations for stresses in soil by Boussinesq's equation and Westerguard's theory. **5**

c) In a proctor test the following observations were recorded

| Water content (%) | Bulk density (gm/cc) |
|---|---|
| 10 | 1.800 |
| 12.5 | 1.935 |
| 15 | 2.010 |
| 20 | 2.020 |
| 24.5 | 1.820 |

Plot the moisture density curve and find MDD and OMC. Also plot zero Air voids line on the same curve. **6**

SECTION – II

7. a) Samples of a dry sand are to be tested in triaxial and direct shear tests. In the triaxial test the sample fails when the major and minor principal stresses are 980 and 280 KN/$m^2$, respectively. What shear strength would be expected in the direct shear test when normal stress is 240 KN/$m^2$ ? **6**

b) State the laboratory tests for shear strength determination and explain the merits and demerits of triaxial shear test over the other tests. **6**

c) State and explain the factors affecting shear strength of soil (any six factors). **6**

OR

8. a) Describe the terms sensitivity and thireotropy. **6**

b) Explain unconfined compression test for determination of shear strength. **6**

c) A vane 10.8 cm long, 7.2 cm in diameter, was pressed into soft clay at the bottom of a bore hole. Torque was applied and the value at failure is to be determined if the shear strength of the clay on horizontal plane is 42 KN/$m^2$. **6**

9. a) Explain Rehbann's method for graphical determination of lateral earth pressure. **6**

   b) Explain slope classification. **4**

   c) An excavation is made with a vertical face in a clay soil which has Cu = 50 KN/$m^2$, $\gamma$ =18 KN/$m^3$. Determine the maximum depth of excavation so that excavation is stable (Assume $S_n$ = 0.261). **6**

OR

10. a) Draw the pressure diagram and find the relation for active thrust for cohesionless soil in submerged condition. **6**

    b) What is the critical height of slope and how is it determined ? **4**

    c) A retaining wall with smooth vertical back is 5 m high and backfill has properties – $\phi$ = 30° and $\gamma$ = 18 KN/$m^3$ and is cohesionless. Show the active earth pressure distribution, assuming water table at base of the wall and determine active thrust and its point of application. **6**

11. a) Explain slacking and durability of rocks. **8**

    b) Discuss In situ stresses in rocks and shear strength of rocks. **8**

OR

12. a) Write short notes on :

    i) Porosity

    ii) Hardness. **8**

    b) Explain in brief different methods of rock classification and its significance. **8**

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**[3863] – 40**

# T.E. (Prod. Engg./Prod. Engg. S/W) (Semester – II) Examination, 2010
# 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) Draw a neat line diagram for organization of a database and explain. **7**

   b) What are the advantages and limitations of database processing ? **5**

   c) Explain the role of databases in manufacturing ? **4**

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

**P.T.O.**

## Unit – II

3. a) Create a table 'sales_order_details' in SQL with the following constraints on the table : **3**

| Column Name | Data type | Size | Attributes |
|---|---|---|---|
| S_order_no | Varchar2 | 6 | Primary key |
| Product_no | Varchar2 | 6 | Primary key |
| Qty_ordered | Number | 8 | Not null |
| Qty_disp | Number | 8 | -- |
| Product_rate | Number | 8,2 | Not null |

b) Give an expression/s in SQL for each of the following queries from the table sales_order_details : **8**

i) List the names of products whose name starts with letter 'a'

ii) Insert any three records of your choice using INSERT command

iii) Update any one record using UPDATE query

iv) Add a new column dely_date of Date data type.

c) Explain 'primary key' and 'foreign key' concepts used in databases. **7**

OR

4. a) Why should you avoid duplication of field in relations ? Is duplication allowed in databases ? If yes, under what conditions ? **4**

b) Explain the following with reference to SQL programming : **8**

i) Principles of NULL value

ii) Grouping data from tables

iii) SQL operators (any four).

c) Explain the role of compound statements AND, OR in SQL programming with an example. **6**

## Unit – III

5. a) Draw a flow chart and psedo C-code for calculating the sum of following series : **10**

$$f(x) = 1 + \frac{1}{2!} + \frac{1}{4!} + \frac{1}{6!} + \frac{1}{8!} + \frac{1}{10!} + - - - - .$$

b) Define the term algorithm and programming language. What are the characteristics of an algorithm ? **6**

OR

6. a) Explain the following in brief : **12**

i) Base band, broad band and carrier band

ii) Bus topology

iii) Token ring.

b) What is LAN ? What are the characteristics of LAN ? **4**

SECTION – II

## Unit – IV

7. a) Draw a flow chart and pseudo C-program to find the root of an equation using Newton-Raphson method. **10**

b) Using Newton-Raphson method, find the real root of the equation $3.x = \cos(x) + 1$ correct to four decimal places. **6**

OR

8. a) Solve by Gauss Elimination method the following equations : **8**

$2.x_1 + 8.x_2 + 2.x_3 = 14$

$6.x_1 + 6.x_2 - x_3 = 13$

$2.x_1 - x_2 + 2.x_3 = 5$

b) Draw a flow chart and pseudo C-program to find the root of an equation using bisection method. **8**

## Unit – V

9. a) The function y = f(x) is given at the points (7,3), (8,1), (9,1) and (10,9). Find the value of y for x = 9.5 using Lagrange's interpolation formula. Also write a C-program to check the validity of the value. **12**

   b) Define absolute, relative and percentage errors. What do you mean by truncation error ? Explain with examples. **6**

OR

10. a) Find the value of sin 52° form the values given below using Newton's forward difference formula : **8**

| $\theta$ | : | 45° | 50° | 55° | 60° |
|---|---|---|---|---|---|
| Sin $\theta$ | : | 0.7071 | 0.766 | 0.8192 | 0.866 |

   b) Draw a flow chart and pseudo C-program for method of least squares to fit a straight line for a given set of points. **10**

## Unit – VI

11. a) Define electronic commerce. List the consumer's benefits of electronic commerce. **8**

   b) What is ERP ? Explain ERP with respect to production and operations management. **8**

OR

12. a) Explain the following terms : **8**

   i) Data

   ii) Information

   iii) Knowledge

   iv) Artificial intelligence

   b) Explain in brief the applications of IT in the following areas : **8**

   i) Materials requirement planning

   ii) Project management.

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**[3863] – 41**

# T.E. (Prod.S/W) (Semester – I) Examination, 2010
# MANUFACTURING ENGINEERING TECHNOLOGY
# (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) 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 – I

1. Differentiate between (**any three**) : **18**
   a) Inspection and quality control
   b) Cost of quality and value of quality
   c) Quality of design and quality of conformance
   d) Quality policy and quality objective.

OR

1. a) What is TQM ? Describe internal and external customer and supplier link concept in TQM. **9**
   b) Explain the methodology and implementation of 'Fives' in large scale manufacturing organisation. **9**
2. Explain following quality management tools. **16**
   a) Fish-bone diagram
   b) Brain storming
   c) Pareto analysis
   d) Pie-chart and check sheet.

OR

**P.T.O.**

2. Explain the following : **16**
   a) Poka - Yoke b) Six-sigma
   c) Zero-defect d) QFD.

3. Discuss metrological properties of measuring instruments. **16**

OR

3. a) Explain with neat sketch Electrical Comparators. **6**
   b) Differentiate between - accuracy and precision. **4**
   c) Explain with neat sketch 'Slip gauge manufacturing'. **6**

SECTION – II

4. a) For 20° pressure angle gear having 40 teeth and 4 mm Module, calculate diameter of plug which fits in tooth space with its center on pitch circle and distance over the plug in opposite tooth space. **4**
   b) Discuss thread crrors and their effects. **8**
   c) Discuss three wire method with neat sketch. **6**

OR

4. Write short notes on : **18**
   a) Parkinson gear testor b) Base tangent method c) Talysurf.

5. a) Write short notes on : **16**
   a) Talor's principle b) Angle dekor c) Autocollimeter.

OR

5. a) Write short notes on : **16**
   a) Tool makers microscope
   b) Optical flat
   c) Profile projector.

6. a) Define flatness. Explain with neat sketch flatness testing methods. **8**
   b) Explain the principles of alignment tests. Discuss any three alignment tests on lathe machine. **8**

OR

6. Write short notes on : **16**
   a) CMM
   b) Roundness testing
   c) Straight wedge method.

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# [3863] – 43

## T.E. (Production/S/W) (Semester – II) Examination, 2010
## BEHAVIOURAL SCIENCE (Old) (1997 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**.*

SECTION – I

1. Differentiate between content and process theories of motivation. Explain 2 factors theory with reference to practical applications. **16**

2. a) What is organisation structure ? Discuss any two types of it. **8**

   b) Discuss in detail about public limited company. **8**

3. a) Mention various personality traits. How these affects on industrial behaviour ? **8**

   b) Discuss main characteristics of industrial licensing. **8**

4. Write short notes on (**any three)** : **18**

   a) Trade unions

   b) Cognitive learning theory

   c) Purpose of an industrial enterprise

   d) Planning and design

   e) Neo-classical theory of organisation.

**P.T.O.**

SECTION – II

5. a) What is organisational behaviour ? State its importance. **8**

   b) Explain the difference between individual and group behaviour and reasons for it. **8**

6. a) What is downward communication ? State its limitations. **7**

   b) Discuss various leadership styles. **9**

7. There is a labour trouble on a shop-floor due to misbehaviour of some of the workers. How will you control the situation ? Enumerate the steps you will take to control it for avoiding its spread to other departments. **16**

8. Write short notes on (**any three**) : **18**

   a) Planning the interview

   b) Managerial grid

   c) Non-verbal communication

   d) Grapevine communication

   e) X and Y theory.

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**[3863] – 5**

# T.E. (Civil) (Semester – I) Examination, 2010
# CONSTRUCTION TECHNIQUES AND MACHINERY
# (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) Assume **suitable** data, if necessary.*

## SECTION – I

1. a) Suggest the scheme of mechanisation for construction of a tunnel in hard rock as well as soft soil. **6**

   b) Explain demolition techniques for following : **6**

      i) Demolition of large empty diesel tank resting on ground.

      ii) Demolition of bridge in crowded area.

      iii) Demolition of a multistoreyed building.

   c) What are the advantages of precast units which are used in building construction ? Explain in detail. **6**

OR

2 a) Give any 3 types of cranes. State their characteristics. Also give application of each with the lifting capacity. **6**

**P.T.O.**

b) What are the equipments used to lift concrete and bricks from ground level to high level of a multistoreyed building ? Describe in detail. **6**

c) Differentiate between labour oriented construction and mechanised construction. **6**

3. a) Explain tremie pipe method of concreting. What are the precautions to be taken during underwater construction ? **8**

b) What are various parts of a RMC plant ? Show them on a neat diagram. Also state advantages and disadvantages/limitations of RMC plant. **8**

OR

4. a) Explain in detail the procedure involved in construction using tunnel form work. **8**

b) What are the different types of concrete pumps ? Draw their sketches and label them properly. **(2+6)**

5. a) Explain in detail, the guniting method. Also state its applications. **8**

b) What is the tremix method of industrial flooring ? Explain with the help of neat labelled sketch. **8**

OR

6. a) Draw neat diagram of a TBM. Label different parts. Explain the working of TBM. **8**

b) Draw a neat labelled sketch of a portable aggregate crushing plant. Explain working of the same. **8**

SECTION – II

7. a) Discuss with examples any six factors which influence selection of equipment for a particular job. **6**

b) Excavation of showel depends upon angle of swing and optimum depth. The following table gives production factor for 90 swing.

Estimate the approximate production factors for 60° and 120° swing, and fill in the blanks in the following table. **6**

| **% of optimum depth** | **Approximate production factor for angle swing of** | | |
|---|---|---|---|
| | 60° | 90° | 120° |
| 60% | ? | 0.91 | ? |
| 100% | ? | 1.0 | ? |
| 120% | ? | 0.97 | ? |

c) Five equipments are shown in fig. A. Give information of these equipment in following tabular form. **6**

| **Sl. No.** | **Name of Equipment** | **Situation for which it is best suited** |
|---|---|---|
| | | |

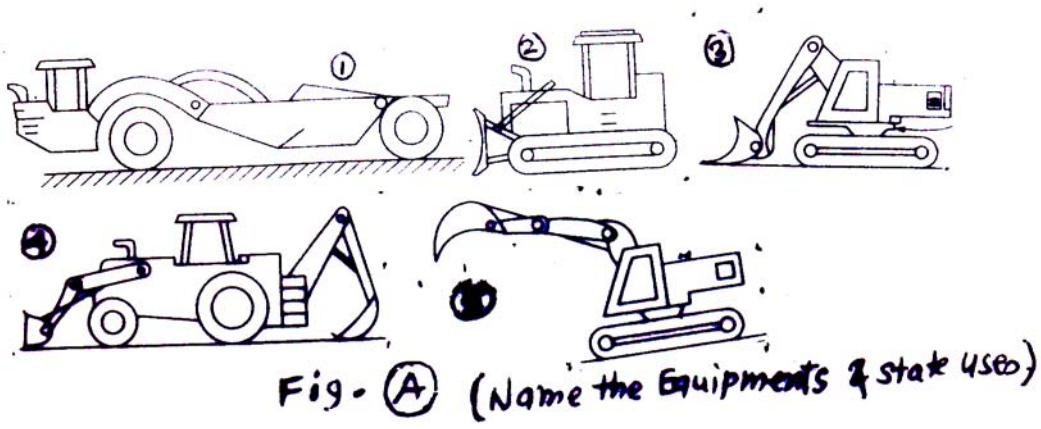


Fig. (A) (Name the Equipments & state uses)

OR

8. a) Differentiate between :

   i) Crawler Tractor and Wheeled tractor.

   ii) Hoe and back hoe. **6**

   b) Identify equipment shown in figure B. Describe any five parts and its functions. State uses and limitations of the equipment. **6**

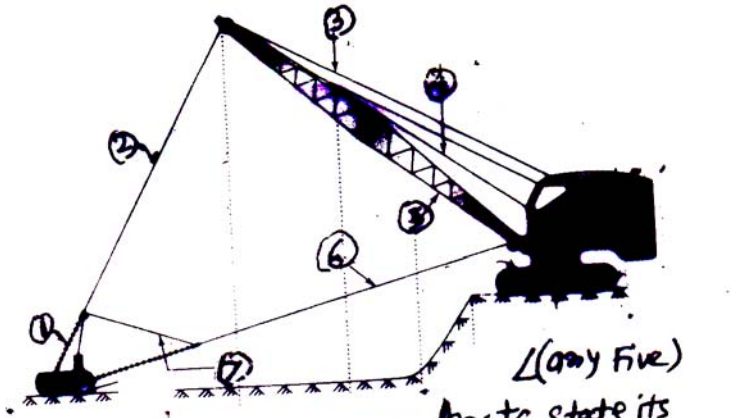


Fig. (B) Identify Equipment, name parts, state its Functions of parts & use of Equipment. (any Five)

   c) Production P per hour of a excavator is given by formula :

   P = NEWCF, where,

   N = No. of cycles /hr.

   E = Efficiency

   W = factor based on angle of swing and % of optimum depth.

   C = Capacity of bucket.

   F = Fill factor.

   Explain factors influencing each of the terms used in formula. **6**

9. a) Write explanatory notes on **(any two)** :

   i) Preventive maintenance.

   ii) Fuel cost.

   iii) Depreciation. **6**

   b) Explain significance and concept of a economic life of equipment. **4**

   c) An excavator costing Rs. 50 lakhs has expected life of 7 years. Scrap value may be assumed as 10% of purchase cost. The excavator is expected to work for 2000 hours in a year. Calculate the yearly depreciation of the machine by any one method. **6**

OR

10. a) Explain the following **(any two)** :

   i) Over head

   ii) Labour cost

   iii) Operating cost. **4**

   b) Explain depreciation and enlist various methods of estimation of the same. Explain any one method in detail. **6**

c) Based on the following data, work out hourly cost of an excavator :

i) Cost of excavator Rs. 55 lakhs.

ii) Useful life = 15,000 hours.

iii) No. of working days/year = 300 days.

iv) No. of shift /day = one.

v) Scrap value = 10%. **6**

11. a) In connection with batch plant

i) Operation with flow chart.

ii) Layout and components.

iii) Functions of four major components. **8**

b) Differentiate between rigid and flexible pavement on **any four** of the following parameters:

i) Cross section ii) Definition

iii) Durability iv) Visibility

v) Suitability vi) Construction and opening to traffic. **4**

c) Justify "Modern roller as a compacting equipment. **4**

OR

12. a) Explain the following :

i) Pavement quality concrete.

ii) Slip form paver in road construction. **6**

b) Explain role played by following in achieving quality of Asphalt mix for Road Project :

i) quality of aggregate

ii) quality of Asphalt. **6**

c) Write short notes on :

i) Dry lean concrete **or**

ii) Classification of Asphalt. **4**

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**[3863] – 6**

## T.E. (Civil) (Sem. – II) (2003 Course) Examination, 2010
## ADVANCED SURVEYING

Time : 3 Hours Max. Marks : 100

SECTION – I

1. a) Define Geodetic Surveying. What factors are to be considered while selecting a best triangulation figure or system ? **6**

   b) From eccentric station E, 14.25 m to the west of main station B, following angles were measured : $\angle BEC = 78°25'32''$, $\angle CEA = 56°30'20''$

   The station E and C are on the opposite side of the line AB, Reduce the angle to the centre B, if AB and BC are 5368.2 m and 4682.3 m respectively. **8**

   c) What are Towers in Geodetic Surveying ? Explain Bilby Towers. **4**

OR

2. a) What is the purpose of Triangulation ? With help of suitable sketches explain the base figures and patterns generally adopted for triangulation network. **6**

   b) Two triangulation stations A and B are 42 km apart and have elevation of 279 and 276 m respectively. Find the minimum height of signal required at B so that the line of sight may not pass nearer the ground than 3 m. The intervening ground may be assumed to have a uniform elevation of 252 m. **8**

   c) Differentiate between Triangulation and Traversing. **4**

**P.T.O.**

3. a) The following are three angles P, Q and R observed at a station 'O', closing the horizon, along with their standard errors. **8**

$\angle P = 84°15'12'' \pm 3''$

$\angle Q = 125°13'15'' \pm 4''$

$\angle R = 150°31'18'' \pm 5''$

Determine the corrected angles.

b) Discuss the procedure for : **(4×2=8)**

1) Figure adjustment of a plane triangle.
2) Figure adjustment of a Geodetic Triangle.

OR

4. a) Form the normal equations for x, y and z from the following equations of equal weight **8**

$4x + 2y + z - 11 = 0$

$3x + 3y + 2z - 9 = 0$

$5x + y + 3z - 16 = 0.$

Determine the most probable values of x, y and z.

b) State and explain various types of errors in surveying measurements. Also give one example of each. **6**

c) Define following terms : **2**

i) True value

ii) Most probable value.

5. a) The following observations were taken in a trigonometric levelling survey. **10**

| | |
|---|---|
| Angle of depression to P at Q | = 1°45′32″ |
| Height of instrument at Q | = 1.18 m |
| Height of signal at P | = 4.22 m |
| Horizontal distance between P and Q | = 6945 m |
| Coefficient of refraction | = 0.07 |

If R.L. of Q is 345.32 m, calculate R.L. of P.

b) What are the advantages of reciprocal observations over the single observation ? **6**

OR

6. a) The following reciprocal observations were made at two points P and Q. **8**

| | |
|---|---|
| Angle of depression of Q at P | = 7′35″ |
| Angle of depression of P at Q | = 9′05″ |
| Height of signal at P | = 4.82 m |
| Height of signal at Q | = 3.95 m |
| Height of instrument at P | = 1.15 m |
| Height of instrument at Q | = 1.28 m |
| Distance between P and Q | = 36320 m. |

Calculate :

i) The R.L. of Q if that of P is 395.46 m

ii) Average coefficient of refraction at the time of observation. Take R sin1″ = 30.88 m.

b) What is Axis signal correction ? Derive an expression to determine the difference in elevation by single observation when the observed angle is angle of elevation. **8**

SECTION – II

7. a) What are the main parts of an aerial camera ? Discuss in brief. **6**

b) Derive an expression for the scale of a vertical photograph. **6**

c) Determine the number of photographs required to cover an area of 25 km × 20 km, if the scale is 1 in 10,000 and the format is 230 mm × 230 mm. Take longitudinal lap as 60% and the side lap as 30%. **6**

OR

8. a) What do you understand by relief displacement ? Derive an expression for the relief displacement in a vertical photograph. **6**

b) A map of the area plotted at the scale of 1 in 20,000 is available. If the length of the runway on the map is 120 mm determine the scale. The photo distance of the runway is 188 mm. **6**

c) Explain in brief the procedure of determining air base distance using mirror stereoscope. **6**

9. a) What do you mean by Modulation ? What are the common methods of modulation used in EDM instruments ? **6**

   b) Enlist the various practical applications of total station. Explain any one in detail. **6**

   c) Explain in brief the principle of Global positioning system. **4**

OR

10. a) Explain in brief the basic principle of remote sensing system. **6**

    b) Explain in brief the following terms : **6**

       i) Measuring wave.
       ii) Carrier wave.
       iii) Modulation.
       iv) Phase difference.

    c) Explain in brief the use of LASER Beam in Alignment of Tunnel. **4**

11. a) What are the objectives of Hydrographic Surveying ? **6**

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

       i) Echo Sounder.
       ii) Station pointer.

    c) Explain in brief self-registering tidal gauge. **4**

OR

12. a) What is sounding ? Enlist various instruments used for sounding. **4**

    b) State various methods of locating soundings and explain the procedure of taking soundings by two simultaneous angles from the boat. **8**

    c) Write a short note on Echo sounder. **4**

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**[3863] – 61**

# T.E. (Electrical) (Semester – I) Examination, 2010
# MICROPROCESSOR FUNDAMENTALS AND 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.*

SECTION – I

1. a) Draw pin diagram of 8085 microprocessor and explain. **10**

   b) Explain and discuss the functions of general purpose and special purpose registers of 8085 A CPU. **6**

OR

2. a) What is the function of timing and control unit of 8085 A ? Discuss. **6**

   b) What do you understand by an instruction cycle ? How it differs from the machine cycle ? Explain using example of CPU 8085 A. **6**

   c) The 8085 A adds 76H and 98H. Specify the contents of accumulator and status of various flags of 8085 A. **4**

3. a) Classify the 8085 instructions in various groups and give atleast three examples of instructions for each group. **10**

   b) Explain the execution of following instructions :

      i) PUSH B

      ii) SHLD addr. **2**

   c) What is the difference between the SUBTRACT and COMPARE instructions ? Explain with examples. **4**

OR

4. a) Write a program for addition of two 8-bit BCD numbers. **6**

   b) Write down a delay routine for 10 ms using the instructions of 8085 having clock period of 3 MHz. **4**

   c) Draw the block diagram showing the memory interfacing with a microprocessor and mention the purpose of each and every signal used therein for interfacing. **6**

5. a) What is an interrupt ? How data is transferred between CPU and I/O devices using interrupts ? **6**

   b) Write down 8085 instructions used for inputting the data from input port and outputting to output port using memory-mapped I/O address space. **6**

   c) Compare the transmission formats-synchronous and asynchronous. **6**

OR

6. a) What are the roles of i) Mode word ii) Command mode and iii) Status word in 8251 A ? **6**

   b) How the data can be transmitted serially from 8085 using its SIM instruction ? Explain with example. **6**

   c) Draw the schematic diagram of interfacing 8251 A with 8085. Interconnections should be such as to get port address for control register and data register as 89H and 88H respectively. **6**

SECTION – II

7. a) Draw block diagram of 8279 keyboard display interface and explain the function of major components. **8**

   b) Explain Mode 2 and Mode 3 of 8254. **8**

OR

8. a) Draw functional block diagram of 8254 and explain function of each block. **8**

   b) Eight LED's are connected to PA of 8255. Write a program to flash these LED's continuously. Write a subroutine to generate time delay of 10 MS. **8**

9. a) The output of ADC is connected to Port A of 8255. Start of conversion is connected to $Pc_3$ of Pc lower. End of conversion is connected to $Pc_7$ of Pc upper. Draw interfacing diagram and write an assembly language program for A to D conversion. **10**

   b) Write an assembly language program to generate square wave using DAC. **8**

OR

10. a) Explain with block diagram how 8085 microprocessor is used to measure power factor. **8**

    b) Draw interfacing diagram of stepper motor control using 8085. Write a program to control stepper motor. **10**

11. a) Draw and explain functional block diagram of 8086. **8**

    b) Explain the role of pointer and index registers in 8085. **6**

    c) What is memory segmentation ? **2**

OR

12. a) How pipe lining is achieved in 8086 ? What are its advantages ? **4**

    b) Explain flag register of 8086. **6**

    c) Explain the functions of following pins of 8086 microprocessor.

       i) RESET ii) NMI iii) $\overline{DEN}$ . **6**

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# T.E. (Electrical Engineering) (Semester – I) Examination, 2010
# 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. a) Define engineering economics. Discuss the need, use and scope of engineering economics. **10**

   b) State and explain the law of demand. **6**

OR

2. a) What is meant by Joint Stock Company ? Explain the procedure for forming a joint stock company. **10**

   b) Define Management. What are the functions of management ? **6**

UNIT – II

3. a) What are the major classes of material handling equipment ? Explain any two material handling equipment used in automated manufacturing environment. **10**

   b) Distinguish between a ‘bid’ and a ‘tender’. What are the different types of tenders ? Explain. **8**

OR

4. a) What do you understand by Inventory ? Explain various ways of controlling inventory. **8**

   b) Define Plant Layout. Explain the following types of plant layout :

      i) Product Layout

      ii) Process Layout. **10**

UNIT – III

5. a) Define 'Recruitment'. Explain various sources and methods of recruitment. **8**

   b) What is 'performance appraisal' ? Explain any two methods of performance appraisal. **8**

OR

6. a) Explain in brief provisions for compensation under Minimum Wages Act. **8**

   b) Define 'Motivation'. Explain the Maslow's Theory of need hierarchy. **8**

SECTION – II

UNIT – IV

7. a) What is the difference between Advertisement and Publicity ? Explain the impact of advertisements on sales promotion. **8**

   b) Define 'Market Segmentation'. What are the bases and advantages of market segmentation ? **8**

OR

8. a) What are the various elements of Prime Cost ? Explain it by giving suitable examples. **6**

   b) What are the different types of capital ? Explain the principal Sources of finance available for a business enterprise. **10**

UNIT – V

9. a) What are the principles and elements of TQM ? Explain. **10**

   b) Describe the seven sources of manufacturing wastes as identified in the JIT system. **8**

OR

10. a) What is a Kanban Card ? What are its types ? Explain its role in JIT manufacturing environment. **10**

    b) What are the qualities and functions of an entrepreneur ? **8**

UNIT – VI

11. a) What is 'self development' ? Explain in brief different methods of self development. **8**

    b) Distinguish between Ethics and Morale. Explain its role in the development of a good professional. **8**

OR

12. a) Define 'Communication'. Explain the process of communication with a neat line diagram. What are the advantages and disadvantages of Verbal and Nonverbal communication ? **16**

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# T.E. (Electrical) (Seemester – II) Examination, 2010
## POWER SYSTEM – II
## (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, Mollier charts, electronic pocket calculator and steam tables is **allowed**.*
*7) Assume suitable data, **if necessary**.*

SECTION – I

1. a) Derive the expressions for the generalised constants A, B, C, D for long transmission line. **7**

   b) Determine A, B, C, D constants for a three phase 50 Hz, transmission line, 400 km long having the following distributed parameters :

   $l = 1.2 \times 10^{-3}$ H/km

   $c = 8 \times 10^{-9}$ F/km

   $r = 0.15\ \Omega$ /km

   $g = 0$. **9**

   OR

2. a) What are travelling waves ? Derive the expressions for it. **8**

   b) Explain what is surge impedance loading ? What are the different methods to improve it ? **8**

3. a) What do you mean by single line diagram of power system ? What is reactance diagram used for analysis of power system, explain with illustration. **8**

   b) What is per unit system ? Why it is used in power system analysis ? Prove that Z p.u. on H.T. and L.T. side of transformer is same. **8**

   OR

**P.T.O.**

4. a) Differentiate between symmetrical and unsymmetrical type of fault. Enlist the type of faults coming under these categories. **8**

   b) What is subtransient, transient and steady state reactance at an unloaded alternator when sudden short circuit takes place on it ? **8**

5. a) Explain in detail the symmetrical components of the unbalanced phase currents under unsymmetrical fault condition used for the fault analysis. **9**

   b) Derive the expression for three phase A.C. power measurement using symmetrical components. **9**

OR

6. Derive the expressions for fault currents of an alternator, with sequence diagram in following types of faults.

   a) Single line to ground fault

   b) Double line to ground fault. **18**

SECTION – II

7. a) Explain with suitable example the method to write circuit equations in the form. $[ I]_{bus} = [ Y ]_{bus} [ V ]_{bus}$. Explain the nature of elements of $[ Y ]_{bus}$ matrix and advantages of $Y_{bus}$ formulation. **8**

   b) Give classification of various types of buses in a power system for load flow studies. Which bus is to be selected as reference bus ? **8**

OR

8. a) What is the importance of load flow study in power systems ? Compare between Gauss-seidal and Newton Raphson method for load flow solution. **8**

   b) The following is the system data for a four bus system. The shunt admittances at the buses are negligible. The line series impedances are

   $Z_{12} = (0.2 + j0.4)$ pu

   $Z_{23} = (0.3 + j0.6)$ pu

   $Z_{34} = (0.1 + j0.3)$ pu

   $Z_{41} = (0.2 + j0.6)$ pu

   Determine $Y_{bus}$ matrix. **8**

9. a) Starting from the first principle, derive the swing equation of a synchronous machine. Explain the use of it. **8**

   b) Explain factors affecting transient stability and methods to improve it. **8**

OR

10. a) Derive the power angle equation for one machine connected to an infinite bus. Draw power angle curve. **8**

    b) A 200 MVA, 11 KV, 50 Hz, four pole turbo generator has inertia constant of 6 MJ/MVA.

       i) Find energy stored in rotor at the synchronous speed.

       ii) Machine is operating at a load of 120 MW and the load suddenly increases to 160 MW. Find rotor retardation. Neglect losses.

       iii) Retardation calculated above is maintained for 5 cycles. Find change in power angle and rotor speed in rpm at the end of this period. **8**

11. a) Discuss the advantages and disadvantages associated with HVDC transmission systems. **10**

    b) Explain constant current control method used in HVDC transmission. **8**

OR

12. a) Explain in detail the classification of HVDC transmission systems. **8**

    b) Explain with the help of suitable diagrams, the different components of HVDC transmission system. **10**

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# T.E. (Electrical) (Semester – II) Examination, 2010
# MICROCONTROLLER AND ITS APPLICATIONS
# (2003 Course)

Time : 3 Hours Max. Marks : 100

***N.B.*** *: 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 in detail classification of 8051 microcontroller. **6**

   b) Write short note on SFR of 8051 microcontroller. **4**

   c) Explain various flags provided in 8051 microcontroller. **6**

OR

1. a) Explain Internal RAM organisation of 8051 microcontroller. **6**

   b) Explain stack operation of 8051 microcontroller. **6**

   c) Explain various factors to be considered while selection of microcontroller for any application. **4**

**P.T.O.**

2. a) Explain the interrupt structure of 8051 with vector address, flag and priority. **8**

   b) Explain Mode 1 and 2 of timer/counter. **8**

OR

2. a) Explain importance of RI and TI flags in serial communication. **8**

   b) Draw TCON register and explain each bit of the same. **8**

3. a) Write an assembly language program to add two 32 bit numbers stored in following internal RAM location.

   40 H – Byte 1 Number 1 50 H – Byte 1 Number 2

   41 H – Byte 2 Number 1 51 H – Byte 2 Number 2

   42 H – Byte 3 Number 1 52 H – Byte 3 Number 2

   43 H – Byte 4 Number 1 53 H – Byte 3 Number 2

   Store result at external RAM location C000H onwards. **9**

   b) Write an assembly language program to separate positive and negative numbers from array of 0AH numbers stored from 40 H onwards. Store positive numbers from 50 H and negative numbers from 60 H onwards. **9**

OR

3. a) Write an assembly language program to add 0FH Hexadecimal numbers stored in array 1 and array 2 and write the result in array 3. The starting address of array 1, array 2 and array 3 are 30, 40 H and 50 H respectively. **9**

   b) Explain different jump instructions of 8051. **5**

   c) Explain concept of range and absolute range. **4**

SECTION – II

4. a) Explain salient features of members of 8051 family. **8**

   b) Write short notes on emulator, simulator, assembler and compiler used for 8051 microcontroller. **8**

OR

4. a) Explain 8051 serial communication with computer through RS 232 link. **8**

   b) Explain steps to receive data serially in 8051 and importance of RI flag. **8**

5. a) With the help of interfacing diagram, flow chart and assembly language program control of stepper motor by using 8051 microcontroller. **9**

   b) Explain with interfacing diagram measurement of temperature using 8051, write assembly language program to store the temperature value at 60 H internal RAM location. **9**

OR

5. Write short notes on :

   a) D.C. motor control using 8051.

   b) Flow measurement using 8051.

   c) Pressure measurement using 8051. **18**

6. a) Write short note on internal memory structure of 8096 microcontroller. **8**

   b) Explain PWM output generation using 8096 microcontroller. **8**

OR

6. a) Draw and explain block diagram of 8096 microcontroller. **8**

   b) Function of watch dog timer in 8096 microcontroller. **8**

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# T.E. Electrical (Semester – II) Examination, 2010
# 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) 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) **Use** of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is **allowed**.*

SECTION – I

1. a) Compare non- salient pole synchronous machine with salient-pole synchronous machine. **4**

   b) Derive expression for power (P) in terms of load angle ($\delta$) for non-salient pole generator. Plot $p - \delta$ characteristics from the derived equation. **6**

   c) A 3-phase, 2.75 MVA, 2-Pole, 3000 rpm, star connected alternator has 36 stator slots. Winding pitch is one slot less than pole pitch. Each slot has 20 conductors. Fundamental flux is 0.073 wb and 3rd harmonic flux is 10% of fundamental flux. Find the voltage induced due to fundamental and 3rd harmonic flux. **6**

OR

2. a) Define coil span factor and pole span factor for an ac generator and derive equation for emf induced per phase in armature winding. **6**

   b) A 11 kv, 1000 KVA, 3-phase, star connected alternator has a resistance of 1.5 $\Omega$ per phase. The open circuit and full load zpfc are given below. Find the voltage regulation of the alternator for full load current at 0.8 pf lagging by using Potier method.

| $I_f$ (A) | 40 | 50 | 110 | 140 | 180 |
|---|---|---|---|---|---|
| $V_{oc}$ (line)(V) | 5800 | 7500 | 12500 | 13750 | 15000 |
| $Z_{pf}$ line volts (V) | 0 | 1500 | 8500 | 10500 | 12500 |

**6**

   c) Explain why O.C.C. curve and S.C.C. is straight line characteristics for the alternator. What is air-gap line ? **4**

**P.T.O.**

3. a) Explain the slip test for the measurement of $x_d$ and $x_q$ of salient pole synchronous machine. **6**

   b) Draw and explain phasor diagram of salient pole synchronous generator supplying leading power factor load. **6**

   c) Calculate the value of synchronizing power in kilowatts for 1 mechanical degree of displacement at full load 0.8 p.f. lagging for a 3-phase, 1000 KVA, 3300 V, 50 Hz, 500 rpm machine having a synchronous reactance of 20% and negligible resistance. **4**

OR

4. a) List the various methods of synchronizing of 3-phase ac generators. Explain one-dark and two equally bright lamp method with neat circuit diagram. **8**

   b) An alternator has a d-axis synchronous reactance of 0.8 pu and a q-axis synchronous reactance of 0.5 pu. Determine the pu open circuit voltage for full load at a lagging power factor of 0.8. Neglect saturation. **8**

5. a) Explain the operation of synchronous motor under

   i) constant load, varying excitation

   ii) constant excitation, varying load. Discuss how synchronous motor can function as a synchronous capacitor. **10**

   b) A 3000 V, 3-phase synchronous motor running at 1500 rpm has its excitation kept constant corresponding to no load terminal voltage of 3000 V. Determine the power input, power factor and torque developed for an armature current of 250 A if the synchronous reactance is 5 $\Omega$ per phase and armature resistance neglected. **8**

OR

6. a) Explain an experimental method of determining V curves and inverted V curves for the synchronous motor. **6**

   b) Explain the following performance characteristics of synchronous-induction motor. **6**

   i) Reactive power Vs power output

   ii) Current input Vs power output

   iii) Power factor Vs power output.

   c) Explain how the speed of synchronous motor can be changed. Also explain why it runs at a constant speed or not at all. **6**

SECTION – II

7. a) Explain the construction and working principle of single phase reluctance motor. What are the applications of reluctance motor ? **8**

   b) Explain for hysteresis motor

      i) Rotor construction

      ii) Working principle

      iii) Torque-speed characteristics

      iv) Applications. **8**

OR

8. a) Explain the important characteristics of permanent magnet stepper motor. **4**

   b) Derive expression for linear force developed in linear Induction Motor. **6**

   c) Explain three-phase three pulse brushless d.c. motor. **6**

9. a) What are the causes of producing harmonic in 3-phase induction motor ? What are the effects of space harmonics on 3-phase induction motor performance ? **8**

   b) A 3-phase, 4-pole induction motor has 48 stator slots and 52 rotor slots. Find the rotor speed at which harmonic synchronous torque would be developed. **8**

OR

10. a) Explain clearly the methods to reduce harmonic effects in synchronous machines. **8**

    b) Explain clearly the methods of reducing harmonic torques and vibrations in 3-phase induction motor. **8**

11. a) Draw and explain the generalized model of a 3-phase synchronous machine and write voltage equations for the same. **10**

    b) What are the steps to apply generalised theory to electrical machines ? **8**

OR

12. a) What are the restrictions of generalized theory of electrical machines ? **6**

    b) Draw and explain the primitive model of 3- phase induction motor. Also write current and voltage equations.. **8**

    c) Draw a neat basic diagram for induction machine that can be used to analysis of induction motor. **4**

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## T.E. (Electrical) (Semester – II) Examination, 2010
## 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) State and prove Kelvin's law for feeder design with reference to supply system. State limitations of Kelvins law. **8**

   b) Compare 1 phase 2 wire overhead system with 3 phase 3 wire overhead system for volume of conductor material required. Clearly state the assumptions made. **8**

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) Distinguish between a distributor and feeder. **6**

**P.T.O.**

UNIT – II

3. a) Draw duplicate busbar system used in substation. List various equipments used in it. **7**

   b) Explain the terms – **9**

      i) Touch potential

      ii) Step potential

      iii) Transfer Potential

OR

4. a) Explain in detail soil resistivity and different factors which affect the soil resistivity. **8**

   b) Explain in detail classification of substation. **8**

UNIT – III

5. a) Explain in detail importance and necessity of maintenance. **10**

   b) Define and explain its significance w.r.t. condition monitoring – **8**

      i) Polarization index.

      ii) Dielectric absorption ratio.

OR

6. a) Discuss planned and preventing maintenance of generators. **8**

   b) Explain in detail the process of deterioration of insulation. **10**

SECTION – II

UNIT – IV

7. a) Discuss in detail different failure modes of transformer. **10**

   b) What is dissolved gas analysis ? How it is used for condition monitoring of transformers ? **8**

OR

8. a) Explain transformer oil contamination process. Explain the filtration of transformer oil with block diagram. **10**

   b) Explain process of condition monitoring of on load tap changer used in power transformers. **8**

## UNIT – V

9. a) Explain in detail condition monitoring of power cables. **8**

   b) Write detail note on thermography. **8**

OR

10. a) Explain signature analysis and its use in condition monitoring of electrical equipments. **8**

    b) What are the various abnormal operating conditions in induction motor and their causes ? **8**

## UNIT – VI

11. a) What are different failures modes of bearing ? **8**

    b) Write note on vibration signature analysis. **8**

OR

12. a) With relevant figures explain the nomenclature of the bearings. **8**

    b) Write note on spark pulse measurement. **8**

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# T.E. (E & TC/Electronics, Indle. Elex) (Semester – I) Examination, 2010
# DIGITAL DESIGN AND COMPUTER ORGANISATION
# (2003 Course)

Time: 3 Hours Max. Marks: 100

***Instructions**: 1) In Section **I** : Attempt Q.**1** or Q.**2**, Q.**3** or Q.**4**, Q.**5** or Q.**6**. In Section **II** : Attempt 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) Draw and explain block diagram of Mealy and Moore machine. **6**

   b) Explain the working of serial adder with the help of a state diagram. **6**

   c) Explain the fundamental and pulse mode asynchronous sequential circuits. **4**

OR

2. a) What are the static and dynamic hazards ? Explain how static hazards are eliminated. **6**

   b) Explain ASM chart notations in detail. **6**

   c) Compare ASM chart and state diagrams. **4**

3. a) Explain different classes of data objects in VHDL with example for each. **8**

   b) Explain the following statements used in VHDL with suitable example :
      i) Process
      ii) If
      iii) With select
      iv) Wait. **8**

OR

4. a) Explain different modelling styles used in VHDL. Write a VHDL code for 4:1 multiplexer using any one modelling style. **8**

   b) What is the difference between concurrent and sequential statements of VHDL ? **4**

   c) What is the use of library clause and use clause ? Give example. **4**

5. a) Explain the concept of look ahead carry generator. Explain its advantages. **6**

   b) Draw a flow chart and explain the Booth's Algorithm used for signed number multiplication. **6**

   c) Describe the IEEE standard for single precision and double precision floating point numbers. **6**

OR

6. a) Perform non-restoring division for the following :

   Dividend = 1011

   Divisor = 0101 **8**

   b) What are rules used to perform floating point multiplication and division ? **6**

   c) Define the following terms with respect to IEEE floating point numbers :
      i) Guard bits
      ii) Rounding. **4**

SECTION – II

7. a) Describe following addressing modes along with suitable examples.
      i) Register mode
      ii) Index mode
      iii) Immediate mode. **6**

   b) What are condition codes ? Explain the use of them. **6**

   c) What do you mean by branching ? **4**

OR

8. a) Draw and explain single bus organisation of the CPU. **6**

   b) State and explain what happens after a subroutine is called from a program ? **6**

   c) Give difference between stacks and queues. **4**

9. a) Discuss with suitable example programmed I/O and interrupt driven I/O. **8**

   b) What is DMA ? What are the different DMA modes ? Explain. **8**

OR

10. a) Explain interface between printer and processor. Also explain communication between them. **8**

    b) Explain synchronous bus in an output operation with timing diagram. **8**

11. a) Explain the concept of virtual memory. How virtual address is translated to physical address ? **8**

    b) What are different cache mapping techniques ? Explain any one with neat diagram. **6**

    c) Explain functioning of CD-ROM. **4**

OR

12. a) Write short notes on : **12**
    i) Characterstics of memory
    ii) RAID
    iii) Interleaved memory.

    b) Explain DVD and Magnetic Disk. **6**

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# T.E. (Electronics and Telecommunication /Electronics Indl. Elex)
## Semester – I Examination, 2010
## ANALOG INTEGRATED CIRCUITS-DESIGN AND APPLICATIONS
## (2003 Course)

Time : 3 Hours Max. Marks : 100

***Instructions :*** *1) Answer **any 3** 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.*
*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 with neat diagram the technique of improving CMRR of op-amp using current mirror circuit. **6**

   b) Draw the basic building blocks of op-amp. Explain the function of each block towards properties of op-amp. **6**

   c) What are the ideal properties of op-amp ? Explain the concept of virtual ground and virtual short. **6**

OR

2. a) What are the different types of integrated circuit packages ? Explain fabrication based classification of op-amp. **6**

   b) Explain the significance of following parameters of op-amp along with their typical value for op-amp IC 741C and OP-07. **8**
      i) CMRR
      ii) Input offset current
      iii) Input offset voltage
      iv) Slew Rate.

   c) Write short note on 'Widlar Current Source'. **4**

**P.T.O.**

3. a) What is the difference between active filter and passive filter ? What are the limitations of basic integrator ? Draw the neat circuit diagram of practical integrator and explain its operation with its frequency response. **10**

   b) Draw and explain the voltage to current converter for grounded load. **6**

OR

4. a) What are the requirements of instrumentation amplifier ? Draw the circuit diagram of instrumentation amplifier using three op-amps and derive its expression for gain. **8**

   b) Explain how the limitations of basic differentiator are overcome in practical differentiator. Design a practical differentiator using op-amp for input signal having frequency 1 KHz. **8**

5. a) Draw and explain :

      i) Sample and hold circuit

      ii) Clipper circuits. **8**

   b) Explain with neat circuit diagram and waveforms how full wave rectification of signal having amplitude less than 0.7 V can be achieved using op-amp. **8**

OR

6. a) Draw and explain :

      i) Peak detector
      ii) Window detector. **8**

   b) Design an inverting Schmitt trigger using op-amp with upper threshold voltage is +2V and lower threshold voltage is –1 for output voltage swing is $\pm$ 10V. **8**

SECTION – II

7. a) Draw the circuit of monostable multivibrator using IC 555 and explain the working with neat waveforms and derive the expression for time period. **8**

   b) Design the triangular waveform generator using op-amp for following specifications.

   Amplitude of square wave = $\pm$ V sat

   Amplitude of triangular wave = $\pm$ 3 V

   Frequency of output waveform = 800 Hz

   Power supply voltage = $\pm$ 15 V

   Use Schmitt trigger and Integrator configuration. **10**

   OR

8. a) Design an asymmetrical square wave generator to generate a pulse of 100 microseconds at a frequency of 1 KHz. Use op-amp IC 741 with supply voltage of $\pm$ 15 V. **8**

   b) Write short note on :

   I) Saw tooth waveform generator.

   II) Quadrature sine wave oscillator. **10**

9. a) State advantages of active filters over passive filters. Classify active filters. Explain the different popular types of class or alignment of active filters. **8**

   b) Design a first order low pass butterworth filter with a cut-off frequency of 15 KHz and pass band gain of 1.8. Obtain its frequency response. **8**

   OR

10. a) Design a wide bandpass filter having lover cut-off frequency of 400 Hz and higher cut-off frequency of 2KHz and pass band gain of 4. Draw the frequency response of the filter. **8**

    b) Explain how LPF can be transformed into BPF by frequency transformation. **8**

11. a) Draw a circuit diagram of antilog amplifier using op-amp and derive the expression for output voltage. Explain its one application in detail. **10**

    b) Draw and explain the working of PLL as AM detector. **6**

OR

12. a) With neat circuit diagram explain function of each block of basic PLL and define the following terms of PLL

    i) Free running frequency

    ii) Lock range

    iii) Capture range

    iv) Pull in time. **8**

    b) Write short notes on :

    i) Log amplifier using transistor

    ii) Square root and divider circuits using analog multiplier. **8**

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**[3863] – 73**

# T.E. (E & TC/Electronics, Indl.Elex) (Semester – I) Examination, 2010
## 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) Assume suitable data, if **necessary**.*

SECTION – I

1. a) Define the terms "Time Average" and "Ensemble Average" of random variables supported by relevant expressions. **8**

   b) Three amplifiers having following characteristics :

   $F_1$ = 9 dB $G_1$ = 48 dB

   $F_2$ = 6 dB $G_2$ = 35 dB

   $F_3$ = 4dB $G_3$ = 20 dB

   are connected in random. Determine the sequence of combination which gives best noise figure referred to the input. Calculate overall noise figure and equivalent noise temperature in this case. **8**

OR

2. a) Show that a band limited signal of finite energy which has no frequency components higher than "W" Hz is completely described by specifying values of the signals at an instants of time separated by $^1/_2$ W seconds. Also show that if the instantaneous values of the signals are separated by an interval larger than $^1/_2$ W seconds, they fail to describe the signal. **8**

   b) The signal x(t) = cos (200 $\pi$ t) + 0.25 cos (700 $\pi$ t) is sampled at the rate of 400 samples per seconds sampled waveform is then passed through an ideal low pass filter with 200 Hz band width. Write an expression for filter output and sketch the frequency spectrum of sampled waveform. **8**

**P.T.O.**

3. a) Explain with neat and suitable diagram, the "Adaptive Delta Modulation Technique" along with its merits and demerits over the other similar techniques. **8**

   b) A 7 bit PCM system employing uniform quantization has an overall signalling rate of 56 kbps.
   Calculate :
   i) The signal a quantization noise ratio that would result when its input is a sine wave with peak to peak amplitude equal to 5.
   ii) The dynamic range for the amplitude of the sine wave i/p so that the signal to quantization ratio may be less than 30dB. **10**

OR

4. a) Compare PCM, delta modulation and adaptive delta modulation on the basis of
   i) Block diagrams ii) Sampling rate
   iii) Bit rate iv) Area of application **8**

   b) For a DM scheme, the voice signal is sampled at a rate of 64 KHz. The maximum signal amplitude is 1 volt. Band width of the voice signal is 3.5 KHz.

   Determine :
   i) The minimum value of stepsize to avoid slope overload
   ii) The granular noise no.
   iii) Assuming signal to be sinusoidal, calculate signal power and S/N ratio
   iv) Assuming that noise signal amplitude is uniformly distributed in the range (–1, 1), determine the signal power and S/N ratio. **10**

5. a) What are different types of Digital Multiplexers ? Explain in detail with neat block diagram any one type of digital multiplexer. Also elaborate the functional operations performed by digital multiplexers. **8**

   b) 24 voice channels of 4 KHz band width each sampled at Nyquist rate and encoded into 8 bit PCM are Time Division Multiplexed with 1 bit per frame as synchronization bit. What is the bit rate at the output of multiplexer ? **8**

OR

6. a) What is the need of data scrambling ? Describe with the help of block diagram the data scrambler and unscrambler. **8**

   b) For the bit stream "11001001", draw the following line code formats.
   i) Bipolar NR2 ii) Split phase Manchester
   iii) Polar R2 iv) AMI

   Also sketch the power spectral density (PSD) for (i) and (iii) formats and compare them with respect to suitability to line. **8**

SECTION – II

7. a) Explain the quadrature phase shift keying technique for digital CW modulation with relevant mathematical expressions, spectral diagrams and signal space representation. Also draw the block diagram for generation and detection of QPSK signals. **8**

   b) In a digital CW communication system, the bit rate of NR2 data stream is 1 Mbps and carrier frequency is 100 MHz. Find the symbol rate of the transmission and bandwidth requirement of the channel in the following cases

   i) BPSK system

   ii) QPSK system

   iii) 16-ary PSK system. **8**

OR

8. a) Explain with suitable mathematical expressions, waveforms and signal space representation, the minimum shift keying techniques of digital CW modulation. Also draw the block diagrams for generation and reception of MSK signals. **8**

   b) The following bit streams are to be transmitted using DPSK scheme

   i) 1011100011

   ii) 110100011

   Determine and sketch the encoded sequence and transmitted phase sequence. **8**

9. a) Prove that "The performance of integrator and dump filter is identical to that of the matched filter on the background of AWGN". Calculate the probability of error Pe. **5**

   b) Derive an expression for impulse response of a matched filter. Clearly specify the assumptions made. **8**

   c) A bipolar binary signal is applied as an input to an integrator and dump receiver such that

   $S_1(t) = +A$ and $S_2(t) = -A$ volts for the duration of 0 to T seconds. If $P(S_1) = P(S_2) = 0.5$, $\eta/2 = 10^{-9}$ W/Hz, A = 10 mV and transmission data rate is 10 kbps, then find out the probability of error 'Pe'. **5**

OR

10. a) Write a short note on :
    i) Correlator
    ii) Optimum filter. **8**

    b) Binary data is transmitted over a microwave link at a rate of $10^6$ bps and the PSD of noise at the receiver input is $10^{-10}$ W/Hz. Find out an average carrier power required to maintain an average probability of error Pe $\leq 10^{-4}$ for coherent binary FSK. What is the required channel band width ?

    (Given erf(2.5) = 0.9959 and erf (3.00) = 0.99998). **10**

11. a) What is the basis of selecting the output taps of shift register, to generate maximum length Pseudo noise sequence ? Explain in detail the criterion for selecting a particular number of taps for feedback for logic circuits.

    Develop a schematic for PN sequence to get maximum length of 255 states. **8**

    b) A PN sequence generator makes use of 8 shift registers and has a chip rate of 10 MHz. Sketch the waveform for autocorrelation function and PSD of PN sequence. **8**

OR

12. a) What is multiple accessing techniques ? Explain in detail the CDMA technique. **8**

    b) A slow FH/MFSK system has the following parameters
    i) The number of bits/MFSK symbol = 4
    ii) The number of MFSK symbols per hop = 5

    Determine :
    i) Processing gain of the system in dB. **8**

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**[3863] – 75**

# T.E. (E&TC/Electronics, Indl. Elex) (Sem. – I) Examination, 2010
## 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) Draw sketches and figures using* ***pencil*** *only.*

SECTION – I

1. a) Briefly explain any six terms with reference to a measuring system. **12**

   b) Explain role of electronics in Mechatronics system. **4**

OR

2. a) Explain the components of Robot with schematic. **8**

   b) Four strain guages of 120 Ω resistance and guage factor 2.1, are mounted on a solid cylinder of mild steel having 40 mm diameter. The guages are connected in Wheatstone bridge. The excitation voltage is 10 V and Young's Modulus for mild steel is $20 \times 10^{10}$ N/m$^2$ and Poisson's ratio is 0.29. Find the output voltage from bridge for a load of 10 kN. **8**

3. a) Enlist the important steps in selection of transducer. Explain the working of proximity sensor. **8**

   b) Describe the flow meter to measure flow of water in a pipe line carrying water to the city from Dam site. (Any type of flow meter be described with appropriate justification) **8**

OR

4. a) What is a cold junction compensation of a thermocouple ? What are the different methods of the same ? Explain in detail. **8**

   b) A parallel plate capacitor transducer has a plate area of 500 $mm^2$ and air separation of 0.5 mm is used to measure displacement of an object coupled to one plate of capacitor. Find capacitance when displacement is 0.1 mm and 0.3 mm. Also find sensitivity of transducer. Assume $\varepsilon = 8.85 \times 10^{-12}$ f / m . **8**

5. a) Explain architecture of PLC with block diagram with specifications of PLC. Draw ladder diagram to implement NAND and NOR gates. **9**

   b) Prepare a ladder diagram for an elevator designed to lift the load from Ground to third floor. The lift should have switching facility to be called from any floor to any floor. **9**

OR

6. a) Explain R12R digital to analog convertor with selection factors for the same. **9**

   b) Explain with circuit diagram gain equation of 3 op-amp instrumentation amplifier. Discuss input impedance, CMRR, and frequency response. Consider 741 op-amp. **9**

SECTION – II

7. a) Draw and explain five channel data aquisition system. **8**

   b) Explain with diagram X – Y recorder with its applications. **8**

OR

8. a) Explain in detail RS 232 bus standard with Pin discription. **8**

   b) Give the applications of $I^2C$ bus with timing diagram. **8**

9. a) Explain with symbol 2/2, 3/2, 5/2 valves. **6**

   b) Compare hydraulic and pneumatic actuators with single acting and double acting cylinder. **6**

   c) Explain the cross section diagramps of following cables.
      i) Co-axial cable ii) Fibre-Optic cable. **6**

OR

10. a) Discuss dynamic response of a single step and torque-speed characteristics in a stepper motor. **9**

b) Explain permanent magnet DC motor with PWM technique for control of the DC motor. **9**

11. a) Design a mechatronic system using strain guges to weigh goods vechicles upto 20 tons. Use DC supply and LED display to display the weight. **10**

b) Discuss working of incremental optical encoder with an encoding scheme to indicate the change of rotary direction. **6**

OR

12. a) Discuss the merits of LVDT based displacement measuring system over a sliding mechanical displacement system. **8**

b) Discuss a conveyor based mateiral handling system employing electronic sensors and material package counting system. **8**

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**[3863] – 77**

# T.E. (E&TC/Electronics, Indl. Elex) (Semester – II) Examination, 2010
# POWER ELECTRONICS
# (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) What are power devices ? Explain with V I chs. working of **8**
   1) IGBT
   2) TRIAC

   With its specifications.

   b) What is dv/dt & di/dt ? Explain in brief. **8**

OR

2. a) What are requirements of trigging circuits ? Explain in brief. **8**

   b) What is Latch up in SCR ? Explain in brief. **4**

   c) Compare between converter grade SCRS and Inverter grade SCRS. **4**

3. a) What are phase controlled converters ? Explain with circuit diagram and waveforms working of $1\phi$ full controlled converter with RL load. Deduce the equation for av. value of O/P voltage and current. **10**

   b) A single phase fully controlled bridge rectifier is fed from 230V, 50Hz supply. The load is highly inductive. Find the av load volt and current if the load res. is $10\Omega$ and firing angle is 45°. **8**

OR

4. a) Explain with neat circuit diagram and waveforms working of $1\phi$ half controlled converter with R load. Deduce the equation for average load volt and cent. **10**

   b) Why Pf is better in case of $S/C^r$ than full controlled converter ? Justify. **4**

   c) Why an RLE(–) load is necessary for inversion in FCC ? **4**

5. a) What are $3\phi$ converters ? Explain with neat circuit diagram and waveforms working of $3\phi$ half controlled converter with R load. Deduce the equation for O/P voltage. **10**

   b) Advantages of $3\phi$ converters over $1\phi$ converters. **3**

   c) Effect of "Ls" source inductance on the O/P of converters. **3**

OR

6. a) Explain with neat circuit diagram and W/FS working of $3\phi$ full controlled converter with RL load. Deduce the equation for av. load voltage. **10**

   b) What is the effect of $3\phi$ system on harmonics ? How the performance can be further improved ? **6**

SECTION – II

7. a) What are inverters ? Explain with neat ckt diagram and waveforms working of 180° conduction mode voltage source inverter with R load. **10**

   b) Compare VSI and CSI. **4**

   c) Explain Harmonics elimination techniques any one type. **4**

OR

8. a) Explain with neat circuit dia and W/FS working of 120° conduction mode VSI with R-load. **10**

   b) What is PWM ? Explain with W/FS any one type of PWM technique. **4**

   c) Features of LM 3524. **4**

9. a) What are resonant converters ? Explain with circuit diagram and W/FS working of ZVS converter. **8**

   b) Explain the operation of step up chopper with waveform. **8**

OR

10. a) Compare Switched mode, Linear and Resonant converters. **4**

    b) What is ZCS ? Explain with ckt diagram and waveforms working of ZCS converter. **8**

    c) What is step-down chopper ? Explain with ckt diagram and waveforms. Comment on result. **4**

11. a) What is UPS ? Explain with block dia working of Off-Line UPS system with waveforms. State its specification and selection criteria. **10**

    b) Why are interactive type Off-Line UPS are cheaper than other UPS system ? **6**

OR

12. Write short notes on **any 3** : **16**

    1) Fly back converters.

    2) SMPS.

    3) Electronic ballast.

    4) HVDC.

    5) 4Q-chopper.

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# T.E. (E & TC/Electronics, Indl. Elex) (Semester – II) Examination, 2010
## 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) **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) Find the impulse response of cascade system, if

$h_1(n) = \left(-\frac{1}{2}\right)^n u(n)$

$h_2(n) = \left(\frac{1}{2}\right)^n u(n)$

Also find the response of $x(n) = \left(\frac{1}{4}\right)^n u(n)$. **8**

b) Find the 'z' transform of

$x_1(n) = e^{-(n/40)} u(n)$

$x_2(n) = e^{-(n/40)} \sin\left(\frac{2\pi n}{8}\right) u(n)$

Draw pole zero diagram of $x_1(z)$ & $x_2(z)$. **8**

OR

2. a) A system is described by following difference equation **8**

$$y(n) + \frac{3}{4} y(n-1) + \frac{1}{8} y(n-2) = x(n) + x(n-1)$$

i) Find step response of system ii) Realize the system using parallel form
iii) Draw pole zero diagram. **8**

b) Find 'Z' transform of following discrete time signals including ROC.
i) $x(n) = e^{-3n}\, u(n-1)$ ii) $x(nT) = (nT)^2\, u(nT)$

**P.T.O.**

3. a) Write the relation between DFT and DTFT also write the relation between DFT and 'Z' transform. **2**

   b) Verify Parseval's theorem for sequence **6**

   $x(n) = \left(\frac{1}{2}\right)^n u(n)$.

   c) Using circular convolution find the output of system if input x(n) and impulse response h(n) are given by

   $x(n) = n + 1 \quad 0 \le n \le 4$

   $= 0 \quad$ elsewhere

   $h(n) = 2\delta(n) + \delta(n-1) + 2\delta(n-2)$ **8**

OR

4. a) Prove that DIT FFT requires less computations than conventional DFT if the length of sequence is large. **4**

   b) Explain DTMF application with importance of Goertzel algorithm in it. **4**

   c) By means of the DFT, determine the response of FIR filter with impulse response $h(n) = \left\{ \underset{\uparrow}{1}, 2, 3 \right\}$ to the input sequence $x(n) = \left\{ \underset{\uparrow}{1}, 2, 3, 4 \right\}$. **8**

5. a) Design the symmetric FIR LPF whose desired frequency response is given as

   $$H_d(\omega) = \begin{cases} e^{-j\omega\tau} & \text{for } |\omega| \le \omega_c \\ 0 & \text{otherwise} \end{cases}$$

   The length of filter should be 7 and $\omega_c$ = 1rad/samples. Use hamming window. **10**

   b) What are FIR filter characteristics ? Explain frequency sampling techniques of FIR filter design. **8**

OR

6. a) Obtain the coefficients of an FIR LPF to meet the specifications given below. Use window technique. **10**

   | | | |
   |---|---|---|
   | Passband edge frequency | = | 1.5 kHz |
   | Transition width | = | 0.5 kHz |
   | Side band attenuation | > | 50 dB |
   | Sampling frequency | = | 8 kHz |

b) Realize the following system function using minimum number of multipliers.

i) $H(Z) = 1 + \frac{1}{3}Z^{-1} + \frac{1}{4}Z^{-2} + \frac{1}{4}Z^{-3} + \frac{1}{3}Z^{-4} + Z^{-5}$

ii) $H(Z) = (1 + Z^{-1})\,(1 + \frac{1}{2}Z^{-1} + \frac{1}{2}Z^{-2} + Z^{-3})$ **8**

SECTION – II

7. a) Design a digital butterworth filter that satisfies the following constraint using bilinear 'z' transformation. Assume T = 1 sec. **12**

$0.9 \le |H(e^{j\omega})| \le 1 \quad 0 \le \omega \le \pi/2$

$|H(e^{j\omega})| \le 0.2 \quad \frac{3\pi}{4} \le \omega \le \pi$

b) Explain Impulse Invariance technique. What is its drawback and how Bilinear transformation over comes it. Explain concept of frequency pre-warping. **6**

OR

8. a) Convert an analog filter with system function H(s) into digital IIR filter. Using impulse invariance method.

$H(s) = \frac{10}{s^2 + 7s + 10}$ **9**

b) Differentiate between analog and digital filters. **5**

c) Determine the order of butterworth approximated filter for following specifications **4**

$\alpha_p = 1$ dB $\quad \alpha_s = 30$ dB

$\Omega_p = 100$ rad/sec $\quad \Omega_s = 500$ rad/sec.

9. a) For given signal x(n)=sin $(2\pi f_0 n)$. Find the output of up sampler defined as $X_u(n) = x(n/3)$

for 12 samples and frequency $f_0$ = 0.12Hz. Draw input and output graphically. **6**

b) What is wavelet transform ? Write its mathematical expression and explain its significance with suitable example. **6**

c) Explain the concept of subband coding of speech/audio signal. **4**

OR

10. a) Design a three-stage decimator that down sample an audio signal by a factor of 96 with following specifications.

Sampling frequency = 96 kHz

Highest frequency of interest in data = 450 Hz

$\delta_p = 0.01,\ \delta_s = 0.001$. **12**

b) Explain in brief sampling rate conversion by a rational factor $1/D$. **4**

11. a) Determine the number of bit required to compute an FFT of 1024 points with signal to noise ratio of 30 dB. **4**

b) Explain in brief how dynamic range scaling is useful to avoid undesirable amplitude oscillations. **4**

c) Write short notes on :

i) Round off error in FFT algorithm

ii) Limit cycles in IIR digital filter. **8**

OR

12. a) Justify the necessity of MAC and barral shifter in DSP processor. **6**

b) What are desirable features of DSP processor ? **4**

c) The output of an A/D converter is applied to digital filter with system function

$H(z) = \dfrac{0.5z}{z - 0.5}$ find the output noise power from digital filter when input signal is quantized to have 8 bits. **6**

**[3863] – 8**

# T.E. Civil (Semester – II) Examination, 2010
## STRUCTURAL DESIGN – II
## (2003 Course)

Time : 4 Hours Max. Marks : 100

***Instructions*** *: i) Answer Q.* ***1*** *or Q.* ***2****, Q.* ***3*** *or Q.* ***4*** *in Section* ***I****.*

*ii) Answer Q.* ***5*** *or Q.* ***6****, Q.* ***7*** *or Q.* ***8*** *in Section* ***II****.*

*iii) Answer to* ***two*** *Sections should be written in* ***separate*** *answer books.*

*iv) Figures to the* ***right*** *indicate* ***full*** *marks.*

*v)* ***Use*** *of I.S. 456-2000 and non-programmable calculator is* ***allowed****.*

*vi) Neat diagrams must be drawn* ***wherever*** *necessary.*

*vii) Mere reproduction from I.S. code as answer, will not be given full credit.*

*viii) Assume* ***any*** *other data if* ***necessary****.*

SECTION – I

1. A) Calculate the design constants for the following materials considering the balanced design for singly reinforced section. The materials are grade $M_{20}$ concrete and mild steel reinforcement. Use W.S.M. **8**

   B) An R.C.C. beam 250 mm wide and 520 mm effective depth is reinforced with 3 No. 16 mm. diameter bars in tension. Find out the depth of neutral axis and state the type of the beam. The materials are $M_{20}$ grade concrete and HYSD reinforcement of grade $Fe_{415}$. Use W.S.M. **8**

   C) A reinforced concrete beam 300 mm wide is reinforced with 1436 $mm^2$ of $Fe_{415}$ HYSD bars at an effective depth of 500 mm.

   If $M_{20}$ grade concrete is used, find

   i) Depth of neutral axis

   ii) Type of reinforced section

   iii) Moment of resistance

   Use L.S.M. **9**

   OR

2. A) Show that the limiting depth of neutral axis for rectangular balanced section reinforced with Fe250, Fe 415 and Fe 500 grade of steel is given as 0.53d, 0.48d and 0.46d respectively. **8**

   B) Calculate the moment of resistance by working stress method for the flanged beam section detailed as below :

   Width of web = 230 mm

   Width of flange = 1800 mm

   Thickness of flange = 120 mm

   Effective depth = 460 mm

   Tension steel = 4 No. 20 mm dia. HYSD bars

   Use Materials – $M_{20}$, $Fe_{415}$

   W.S.M. is recommended. **8**

   C) A tee beam of effective flange width 1200 mm, thickness of slab 100 mm, width of rib 300 mm and effective depth of 560 mm is reinforced with 4 No. 25 mm diameter bars.

   Calculate the factored moment of resistance. The materials are $M_{20}$ grade concrete and HYSD reinforcement of grade $Fe_{415}$. **9**

3. A) A reinforced concrete beam has a support section with a width of 250 mm and effective depth of 500 mm. The support section is reinforced with 3 bars of 20 mm diameter on the tension side. 8 mm diameter 2 legged stirrups are provided at a spacing of 200 mm centres. Using $M_{20}$ grade concrete and $Fe_{415}$ HYSD bars, calculate the shear strength of the support section. **8**

B) A continuous R.C.C. beam of rectangular section is simply supported at A and C and continuous over support B. Span AB = BC = 6 m. The beam carries a dead load of 16 KN/m inclusive of self weight and live load of intensity 24 KN/m. Calculate the design moments at central support B and near midspan AB and BC using 15% redistribution of moments. Draw bending moment envelop. **17**

OR

4. A) A reinforced concrete beam of rectangular section with a breadth of 300 mm and overall depth 850 mm. The section is subjected to a factored bending moment of 200 KN.m. Calculate the ultimate torsional resistance that can be allowed on the section. Use $M_{25}$ and $Fe_{415}$ materials. **8**

B) A reinforced concrete beam has the following data :

Width of section = 300 mm.

Effective depth = 600 mm.

Reinforcement = 4 No. 25 mm diameter bars.

Factored shear force = 400 KN.

Materials : $M_{25}$ grade of concrete, $Fe_{415}$ grade reinforcement.

Design the shear reinforcement using only vertical stirrups. **17**

SECTION – II

5. A centre line plan of a school building is shown in the figure 1 (G + 2 storey). Classify all the slabs and design slabs $S_1$, $S_2$ and $S_8$ using L.S.M. Design the torsional reinforcement for two-way slabs. Draw reinforcement details in plan and sectional elevation. Take LL on all slabs = 4kN/m$^2$ and floor finish 1.2 kN/m$^2$ material $M_{20}$ and $Fe_{415}$. **25**

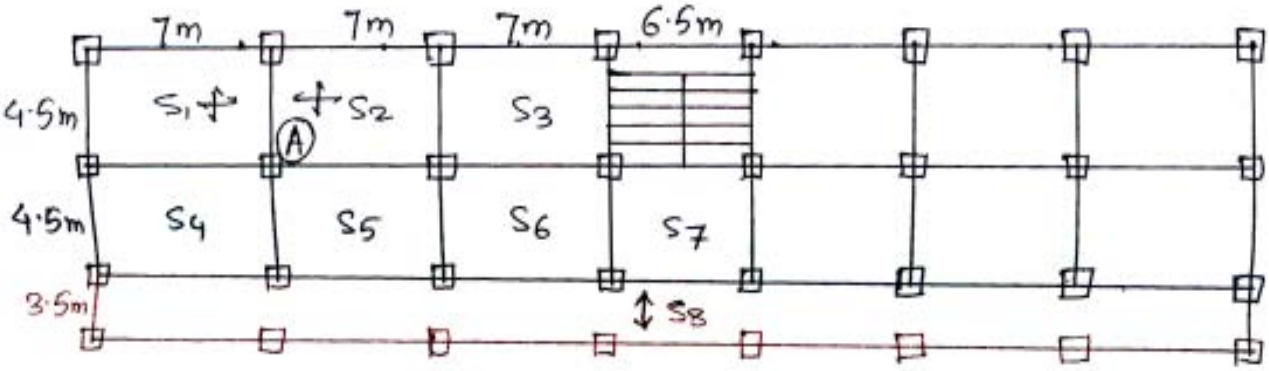



Fig. 1

OR

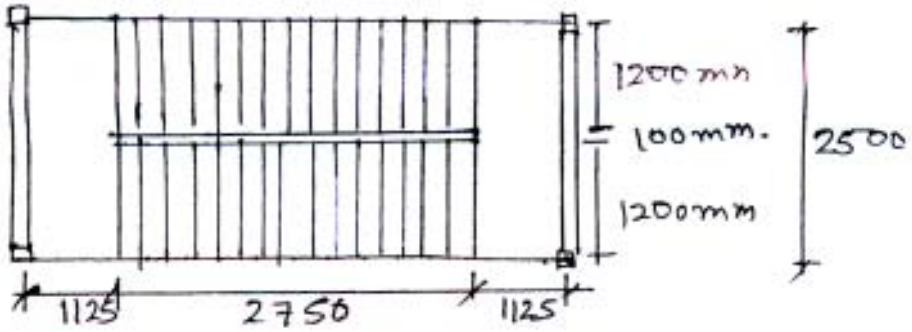
6. Design a dog-legged staircase, first and intermediate flights for a residential building with following details :

   Floor to floor height = 3200 mm

   Rise 150 mm, Tread = 250 mm

   No. of flights 2, Material $M_{20}$, $Fe_{415}$

   Space occupied by steps = going = 2750 mm. landing 1125 mm. Width of room = 2.5 m.




**25**

Figure 2

7. Design a rectangulars column A in ground floor and below the plinth with isolated footing, for following data and data given in Q. 5.

   1) Water proofing load for roof slab 2 kN/$m^2$.

   2) Height of parapit wall 1.2 m.

   3) Thickness of slab 150 mm.

   4) Thickness of wall 230 mm.

   5) Beam size 230×500 mm.

   6) $M_{20}$ and $Fe_{415}$.

   Show detailed load calculation and design calculations. Draw reinforcement details in plan and sectional elevation. **25**

OR

8. Design a short rectangular column with material $M_{25}$ and $Fe_{500}$ with effective height 4 m. carrying working load of 1000kN and moment 240 kNm major axis (parallel to width = 400 mm). Also design the footing for the above column without considering moment take safe bearing capacity of strata as 250 kN/$m^2$. Show detailed load and design calculation and reinforcement detail in plan and sectional elevation.

Consider size of column (400 mm×600 mm) effective cover 60 mm. **25**

**Chart 36 COMPRESSION WITH BENDING — Rectangular Section — Reinforcement Distributed Equally on Two Sides**

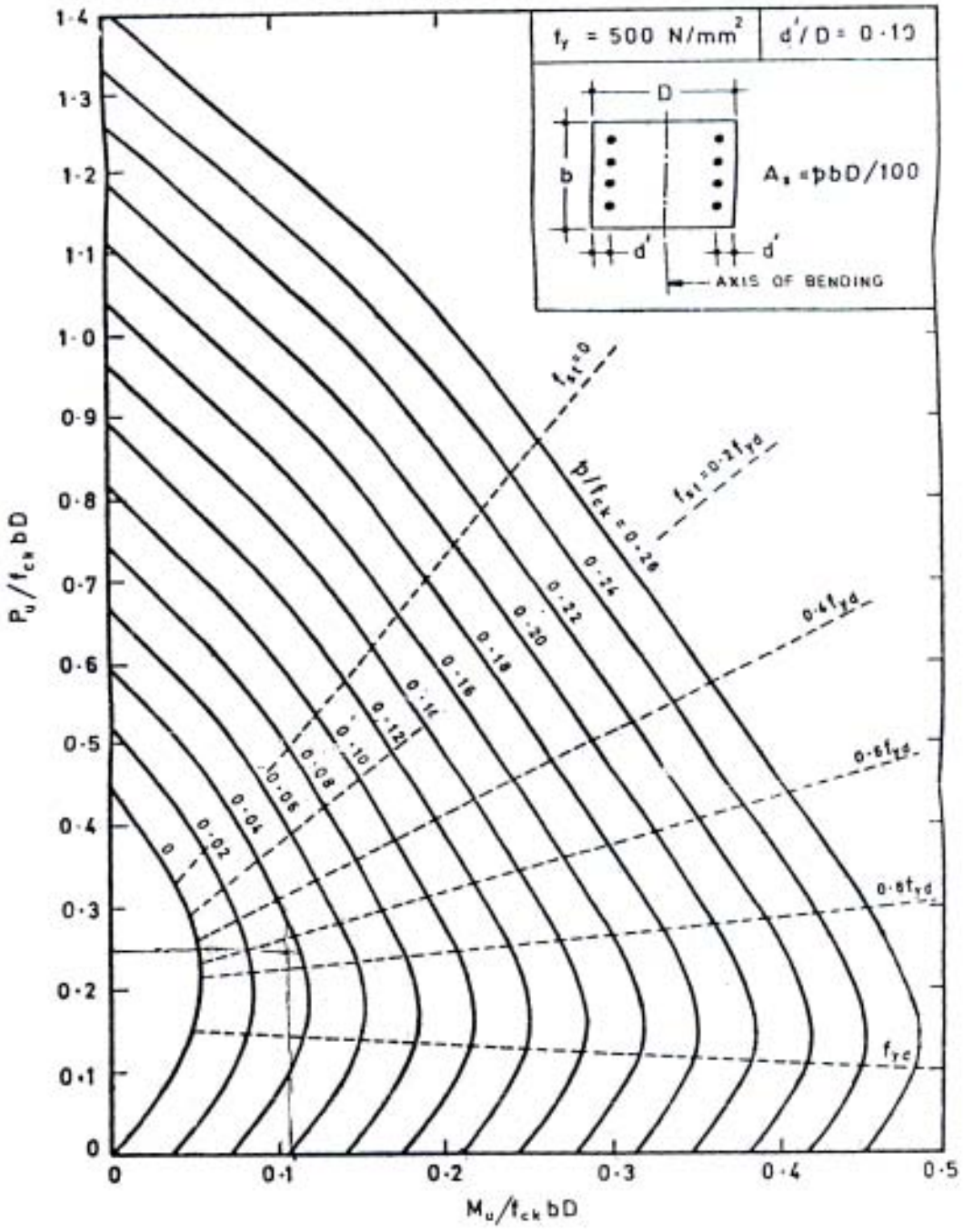
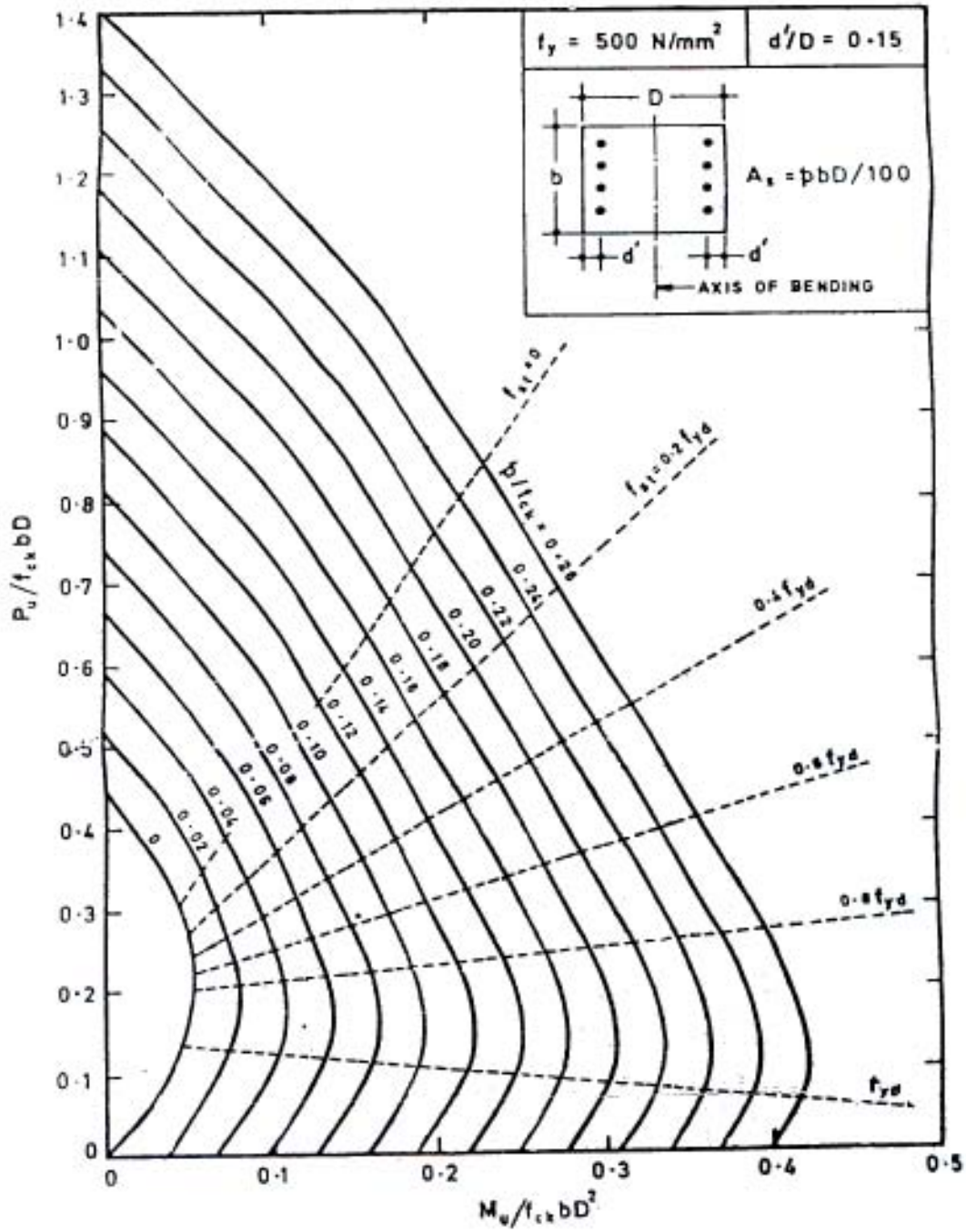


**Chart 37 COMPRESSION WITH BENDING — Rectangular Section — Reinforcement Distributed Equally on Two Sides**



**[3863] – 80**

# T.E. (E & TC (Electronics, Indl. Elex.)) (Semester – II) Examination, 2010
# INFORMATION THEORY & CODING TECHNIQUE
# (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. a) Consider a channel with a noise characteristic as P(Y|X) given by

$$P(Y \mid X) = \begin{bmatrix} 0.6 & 0.2 & 0.2 \\ 0.2 & 0.6 & 0.2 \\ 0.2 & 0.2 & 0.6 \end{bmatrix}$$

and P(X1) = $1/8$, P(X2) = $1/8$, P(X3) = $6/8$ . Find entropy of source, receiver, joint entropy of system, the mutual information and conditional entropies. **10**

b) Define the following terms :
i) Source coding theorem ii) Channel coding theorem
iii) Kraft Inequality. **6**

OR

2. a) Consider the following binary sequence.

11101001100010110100...

Use the Lempel-Ziv algorithm to encode this sequence. Assume that the binary symbols 0 and 1 are already in the code book. **8**

b) Explain the differential entropy and mutual information for continuous ensembles (AWGN channel) with help of expressions. **8**

**P.T.O.**

3. a) Derive the information capacity for colored noise with the help of water filling interpretation model. **8**

   b) Explain the following terms :

   i) Rate distortion theory ii) Data compression. **8**

OR

4. a) Derive the Information capacity theorem with the help of sphere packing model. **8**

   b) State and explain implications of information capacity theorem with relevant diagram. **8**

5. a) For a (6, 3) systematic linear block code, the three parity-check bits C4, C5 and C6 are formed from the following equations :

   $C4 = d1 \oplus d3$

   $C5 = d1 \oplus d2 \oplus d3$

   $C6 = d1 \oplus d2.$

   i) Write down the generator matrix G.

   ii) Construct all possible code words.

   iii) Suppose that the received word is 010111.

   Decode this received word by finding the location of the error and the transmitted data bits. **10**

   b) Write a note on :

   i) Fire codes ii) Golay codes. **8**

OR

6. a) Consider a (7, 4) cyclic code with
   $g(X) = 1 + X^2 + X^3$

   i) Let data word d = (1011).
   Find codeword in systematic form.

   ii) Let Received Codeword C = (1001111). Find the correct data word.

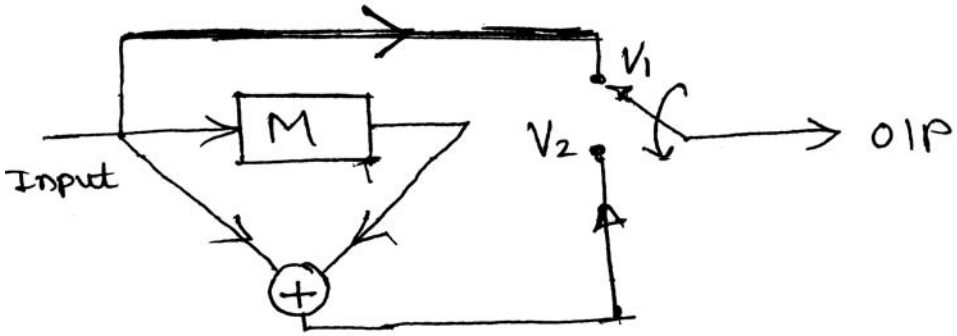
   iii) Hardware implementation of (i) and (ii). **12**

   b) Write a note on :

   i) Burst Error correction. ii) Cyclic Redundancy Check Codes. **6**

SECTION – II

7. a) Consider the convolutional encoder **10**



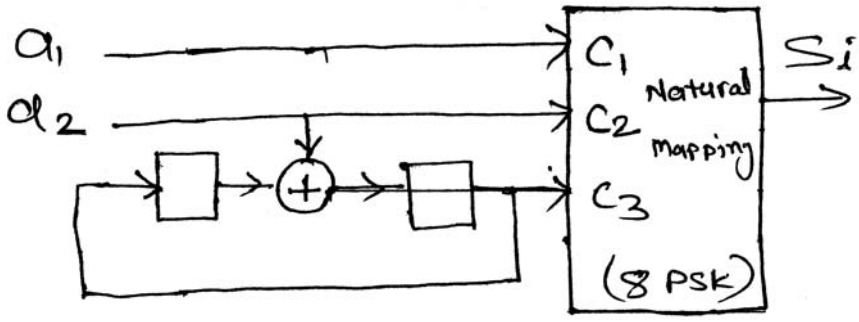

i) Sketch state diagram , tree diagram and Trellis diagram.

ii) Find free distance of this convolution code.

b) What are turbo codes ? Draw and explain the encoder and decoder of the same. **8**

OR

8. a) Consider TCm encoder **12**




i) Draw T rellis diagram

ii) $d^2$ free

iii) Asymptotic gain $g_\infty$.

b) Explain FEC and ARQ system. **6**

9. a) Find the generator polynomial for BCH code over GF(8) using the primitive polynomial $p(z) = z^3 + z + 1$ over GF(2) codeword. The code should correct t = 1, 2, ... errors. **10**

   b) What is the Reed-Solomon code ? Compare it with BCH code with relevant example. **6**

OR

10. a) Compare the performance of the following systems with optimum system (Ideal system) : **10**

   i) Amplitude Modulation

   ii) Frequency Modulation

   iii) Pulse code Modulation.

   b) Explain Symmetric Key Cryptography with block diagram. **6**

11. a) A satellite carrying a 11.7 GHz CW Beacon transmitter is positioned in geosynchronous orbit approximately 38000 Kms from the earth station with G/T of 19.7 dB/°K. The Beacon O/P power is 200 MW and feeds the antenna with gain 18.9 dB. towards the earth station. The effective noise figure of the earth station receiver is 3.0 dB. Determine the strength of Beacon signal at the earth station. **10**

   b) Explain various Kepler's laws with respect to satellite Communication. **6**

OR

12. a) Explain the following terms related to Mobile Communication. **10**

   i) Cells ii) Frequency reuse

   iii) Cell splitting iv) Hand-off.

   b) Explain diversity Concept ? Explain space diversity technique. **6**

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**[3863] – 81**

# T.E. (Instrumentation and Control) (Semester-I) Examination, 2010
## MICROCONTROLLER TECHNIQUES
## (2003 Course)

Time : 3 Hours Max. Marks : 100

***Instructions :*** *1) Answer **any 3** questions from each Section.*

*2) Question Nos. **5** and **10** are **compulsory**. Out of the remaining attempt two questions from Section **I** and 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, Mollier charts, electronic pocket calculator and steam tables is **allowed.***

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

SECTION – I

1. a) Draw and explain the reset circuit of 8051. For how much time the reset pin has to be active for the 8051 to reset? **8**

1. b) State the addressing modes used in the following instructions : **8**

i) ANL 33h, # 52h
ii) MOVC A, @A + DPTR
iii) MOV A, @R0
iv) MOV 0Ah, # 67h
v) SUBB A, #12H
vi) INC R6
vii) ADD 53H, 63H
viii) ADD A, @R1

OR

2. a) Write a program to generate a decimal up counter in register R3, going through all the even stages only. **8**

2. b) Draw and explain the internal structure of port pins of port 0 and port 3 of 8051. **8**

**P.T.O.**

3. a) What are the sources of interrupts in 8051? **5**

   How are the interrupts configured? **3**

3. b) Explain the different modes of timers in 8051 with neat diagram. **8**

OR

4. Write a program to measure width of a pulse using 8051. **6**

   Also draw the flowchart for the same. **4**

   With neat diagram explain the connections done to measure pulse width. **2**

   If the Timer registers read a value of 35 F1 H, interpret the pulse width in microseconds if $F_{OSC}$ = 6 MHz. **4**

5. With neat diagrams write short notes on **(**any **three) :** **18**
   a) Interfacing of LCD display to 8051
   b) Centronics Interface
   c) Interfacing of DAC
   d) Multiplexed LED display using 8051

SECTION – II

6. a) Explain the interfacing of Serial ADC to 8051. **8**

   b) Compare RS 232 and RS 485 with respect to following points : **10**
      i) No. of drivers
      ii) No. of receivers
      iii) Supports Half Duplex, Full Duplex or both
      iv) Maximum Distance
      v) Maximum Speed at Maximum distance

OR

7. An 8051 based temperature control system is to be designed with the control action as on-off. The heater is turned on and off with a relay. The sensor used for temperature measurement is Pt 100. The system is user friendly and has a 4 X 2 keys keyboard. Draw the scheme in detail covering the following points :
   i) Block Diagram **4**
   ii) Keyboard interfacing **4**
   iii) ADC interfacing for sensor signal conditioning **5**
   iv) Relay Interfacing for heater on off **3**
   v) Relay on/off indicator **1**
   vi) Power on indicator **1**

8. a) Explain the following instructions of PIC **8**
   i) RLF f, d
   ii) BSF f, d
   iii) RETURN
   iv) SLEEP

8. b) Write a program in PIC to add 2 16 bit numbers. **8**

OR

9. a) Write a program in PIC to complement the remaining bits of Port B when the Port B interrupt occurs. **8**

9. b) Explain the structure of stack and role of stack in PIC 16CXX **8**

10. Write short notes with respect to PIC 16F8XX (any **two**) : **16**
   a) Interrupt structure
   b) Capture, Compare and PWM Module
   c) ADC module

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# T.E. (Instrumentation and Control) (Semester – I) Examination, 2010
## 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) **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) Find if the following sequence are periodic or not. If yes find its fundamental period. **9**

   i) $x(n) = e^{j(\pi/4)n}$

   ii) $x(t) = \cos(50\ \pi t) + \cos(100\ \pi t)$

   iii) $x(n) = 3 \sin\left(\frac{1}{8}n\right)$.

   b) State whether the given signal is energy or power signal. Justify it
   $x(n) = (0.5)^n\ u(n)$. **9**

   OR

2. a) Sketch a discrete time signal $x(n) = 3^{-n}$ for $-2 \le n \le +2$ and obtain **12**

   i) $y(n) = 2x(n) + \delta(n)$

   ii) $y(n) = x(n).u(2 - n)$.

   b) Obtain the linear convolution of the following sequences using graphical method : **6**

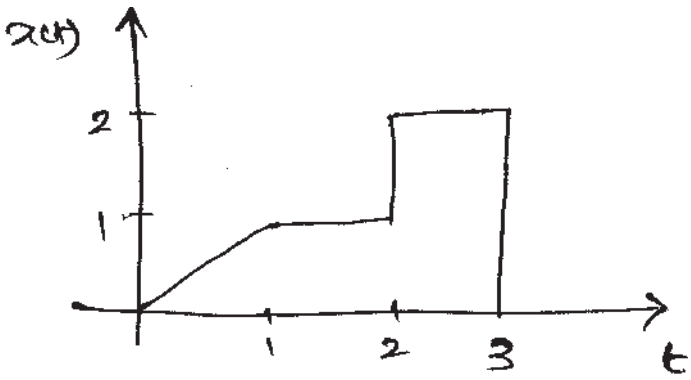
   $x(n) = \{1, \underset{\uparrow}{2}, 1, 2\}$

   $h(n) = \{\underset{\uparrow}{1}, 1, 1\}$

**P.T.O.**

3. a) State and explain the properties of Laplace transform. **10**

   b) Find the Laplace transform of x(t) shown in the fig. **6**




OR

4. a) Find the linear convolution of $x_1(n)$ and $x_2(n)$ using z-transform method. **8**

   $x_1(n) = \{1, 2, \underset{\uparrow}{3}, 4\}$

   $x_2(n) = \{1, 2, \underset{\uparrow}{0}, 2, 1\}$

   b) Find initial and final values of x(n) if z-transform is **8**

$$X(z) = \frac{2}{z^2 + \frac{1}{6}z - \frac{1}{6}}$$

5. a) State and explain the properties of Fourier transform. **10**

   b) Obtain the Fourier transform of a unit step function. **6**

OR

6. a) A LTI system is described by the differential equation **12**

$$\frac{d^2y(t)}{dt^2} + 3\frac{dy(t)}{dt} + 2y(t) = x(t)$$

   Calculate output y(t) if input $x(t) = e^{-3t}\,u(t)$ is applied to the system.

   b) Obtain DTFT of the unit impulse $\delta(n)$. **4**

SECTION – II

7. a) Explain auto-correlation function for the energy signals. **8**

   b) Find the auto-correlation of the sequences **8**

   i) $x(n) = \{1, 1, \underset{\uparrow}{3}, 2\}$

   ii) $x(n) = \{1, 0, -1, \underset{\uparrow}{2}\}$

OR

8. a) Explain cross-correlation function for the power signals. **8**

   b) Find the cross-correlation of the given sequence using graphical method. **8**

   $x(n) = \{1, \underset{\uparrow}{1}, 2, 1\}$

   $h(n) = \{-1, \underset{\uparrow}{2}, 2, 1\}$

9. a) Define Random variable and state their types. **8**

   b) Define cumulative distribution function and give its properties. **8**

OR

10. a) What is probability density function ? Explain its properties. **8**

    b) The PDF of a random variable is given by

    $f_x(x) = e^{-3x}$; for $x \geq 0$

    Find the probability that X will be in the range of 1 to 4. **8**

11. a) Distinguish between FDM and TDM. **9**

    b) Explain PWM in detail. **9**

OR

12. a) Explain in detail Modulation Techniques. **10**

    b) Write short note on Time Division Multiplexing. **8**

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**[3863] – 83**

# T.E. (Instru. and Control) Examination, 2010
# CONTROL SYSTEM COMPONENTS
# (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) **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 basic principle of producing rotating magnetic field. Also state applications of 1 $\phi$ IM. **8**

   b) A 200 V, 6 pole d.c. shunt motor has 600 lap connected armature conductors. Its armature resistance is 0.1 ohm and shunt field resistance is 100 ohm. Assuming the flux per pole as 0.06 wb, calculate the speed of the motor when it draws 20 A from the supply. **8**

   OR

2. a) Why 3$\phi$ synchronous motor is not self starting ? Explain in brief different methods of starting 3$\phi$ synchronous motor. **8**

   b) Explain in brief various industrial applications of DC series, shunt and compound motor with suitable reference of characteristics. **8**

3. a) List various types of stepper motors. Explain any one with neat schematic. Also draw interfacing of a stepper motor with 8051. **12**

   b) Develop from the first principle the expression for the emf generated in the armature of a d.c. machine. **4**

   OR

**P.T.O.**

4. a) Explain with neat sketch DC position control system using servomotor. **8**

   b) Explain with suitable sketch synchro transmitter and receiver. **8**

5. a) Explain with neat sketch working of any two process switches and also give their applications. **12**

   b) Write a short note on electromechanical relay. **6**

OR

6. a) Draw symbolic representation of following switches :

   1) Toggle switch
   2) Rotary switch
   3) Selector switch
   4) Push button

   Also, state one application of each. **12**

   b) Compare relay with contactor. **6**

SECTION – II

7. a) Develop an EWD using std. symbols for any one type of braking applied to a DC motor . **8**

   b) Explain MCC in detail. **8**

OR

8. a) Three induction motors with rating of 1HP, 2 HP and 3 HP respectively are to be started with a sequence of 3-1-2 as per HP rating's . Develop an electrical wiring diagram for the same using std. electrical logic symbols. **8**

   b) Explain with neat sketch the working of thermal overload relay along with suitable application. **8**

9. a) Explain with neat sketch :
   1) Pneumatic power supply
   2) Air filter regulator. **10**

   b) Draw pneumatic ckt diagram using Time delay valve. **8**

OR

10. a) Draw symbols and explain the basic function of the following pneumatic components with example.
   i) Flow control valve
   ii) Pressure reducing valve. **10**

   b) What is cushioning of air cylinder ? State its effect on the cylinder performance. **8**

11. a) Explain in brief metering oil in and metering oil out of a cylinder in Hydraulic system. **8**

   b) Compare pneumatic system with Hydraulic system w.r.t. following points :
   i) Power generated
   ii) Use in hazardous area
   iii) Maintenance
   iv) Applications. **8**

OR

12. a) Using standard hydraulic circuit symbols, develop a circuit for sequencing of two hydraulic cylinders. **8**

   b) Classify hydraulic actuators. Explain with neat sketch any one type of actuator. **8**

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# [3863] – 84

## T.E. (Instrumentation and Control) (Semester – I) Examination, 2010
## ANALYTICAL INSTRUMENTATION
## (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 coulometry in terms of **(1+3+4)**
   i) Principle
   ii) Schematic diagram of Amperostatic titration cell
   iii) Working.

   B) Draw block diagram of various units used in chemical analysis. Give the functions of each block. Name at least one component with respect to each block. **(2+4+2)**

OR

2. A) Explain polarography w.r.to following points : **(1+3+4)**
   i) Principle
   ii) Diagram
   iii) Working.

   B) Give detailed classification of Instrumental methods. **8**

3. A) Explain ratio recording UV-VIS spectro photometer w.r.to following points : **(3+3+2)**
   i) Diagram
   ii) Working
   iii) O/P waveforms at each processing stage.

**P.T.O.**

B) Compare the following : **(2×4)**

i) Single beam and double beam instruments

ii) Prism and grating.

OR

4. A) A reflective diffraction contained 1200 grooves/mm. The angle of incidence of a band of polychromatic radiations was 48.2°. Determine the wavelength that is diffracted at an angle of 11.2° for first order diffraction. **6**

B) Explain atomic absorption spectrophotometer with respect to following points. **(3+4+3)**

i) Diagram

ii) Working

iii) State significance of radiation source in AAS.

5. A) Explain atomic emission spectroscopy w.r.to following pts. **(1+3+4)**

i) Principle

ii) AC and DC arc excitation sources with neat diagrams and its working.

B) Explain the principle of FTIR spectrophotometer w.r.to the points as stated below : **(3+4+3)**

i) Neat diagram

ii) Working

iii) Advantages of FTIR over conventional IR.

OR

6. A) Explain IR spectrophotometer in terms of the following : **(4+3+3)**

i) List different radiation sources and detectors.

ii) Littrow mounting single beam IR spectrophotometer with neat optical ray diagram and its functioning.

B) List out the detectors for flame photometry. Explain any one w.r.to following points : **(2+3+3)**

i) Neat diagram

ii) Working.

SECTION – II

7. A) Draw the neat diagram of ratio fluorimeter and describe its working. **(4+4)**

   B) Explain the working of $CO_2$ gas analyzer with neat diagram. **(5+3)**

OR

8. Explain the following terms w.r.to Nuclear magnetic resonance spectroscopy. **(2+2+3+5+3+1)**

   i) What is NMR ?
   ii) What is precessional motion ?
   iii) Constructional diagram of NMR.
   iv) Functions of each component.
   v) Effect of electronic (nuclear) shielding.
   vi) Application of NMR spectroscopy.

9. A) List the detectors for mass spectrometry. Explain the functioning of any one with neat diagram. Two peaks representing two masses 100.00 and 100.005 respectively and are separated by a 107 valley. Find the resolution w.r.to first peak. **(2+3+3+2)**

   B) Explain katharometer w.r.to following points : **(2+3+3)**

   i) Principle
   ii) Cell diagram
   iii) Working.

OR

10. A) List out different ionisation methods in mass spectrometry. Draw the schematic to obtained high resolution in magnetic mass spectrometer and explain its working. **(2+4+4)**

    B) With neat diagram, explain the functioning of HPLC. **(4+4)**

11. List out the different radiation detectors. Explain any 03 w.r.to following points : **(2+6+8)**

    i) Neat diagrams
    ii) Working.

OR

12. Explain briefly the instrumentation for x-ray spectrometry with neat diagrams. **16**

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# [3863] – 87

## T.E. (Instrumentation and Control) (Semester – II) Examination, 2010
## PROCESS PLANT OPERATION
## (2003 Course)

Time : 3 Hours 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.*

SECTION – 1

1. Explain Unit Operation and Unit processes with suitable examples along with flowsheet symbols. **(16)**

OR

2. Explain distillation and extraction. **(16)**

3. Explain kinetics in chemical industries. Explain rate of reaction in detail. **(16)**

OR

4. Derive performance equation of ideal batch reactor. **(16)**

5. Explain material balance and energy balance with suitable example. **(18)**

OR

6. Write short notes on **(18)**
   1) Cooling Towers
   2) Reflux Ratio
   3) Evaporators

**P.T.O.**

SECTION – 2

7. Explain forth floatation and screening in detail. **(16)**

OR

8. Explain the terms crushing and grinding in detail with suitable. **(16)**

9. Explain the basic concept of corrosion and different types of protection techniques. **(16)**

OR

10. How will you select metals and alloys used in construction of field instruments in detail ? **(16)**

11. Draw and explain the manufacturing of cement with flow sheet. **(18)**

OR

12. Draw and explain the manufacturing of sugar with flow sheet. **(18)**

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**[3863] – 89**

**T.E. (Instrumentation and Control) (Semester – II) Examination, 2010**
**INSTRUMENTATION SYSTEM DESIGN**
**(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) Compare DIN and NEMA standard. **8**

   b) What is significance of "Index of Protection" ? Explain $IP_{56}$ and $IP_{54}$. **8**

   OR

2. a) Compare BIN with ANSI standard. **8**

   b) What are the methods of product designing ? **8**

3. a) What is "Triboelectric effect" ? Explain "Human body model" with diagram. **8**

   b) Explain flatface control panel. Also explain its three types. **8**

   OR

4. a) What are methods used to protect the systems with electrostatic discharge, when connected with interface cable ? **8**

   b) Explain briefly shot noise, thermal noise, popcorn noise and contact noise. **8**

5. a) Explain the features of HCNR 200. Also explain with the help of suitable diagram how HCNR 200 can be used for isolation. **9**

   b) Explain how pressure measurement is possible using AD 620 instrumentation amplifier. **9**

   OR

**P.T.O.**

6. a) 1) What is output voltage of AD 595 when 200°C temperature is applied to pin number 1 and 14 through K type thermocouple ? While output voltage of this thermocouple is observed to be 8.137 mV ? **6**

   2) What caution should be taken while testing AD 595 or AD 594 ? **3**

   b) What are the salient features of XTR 110 ? What is the transfer function of XTR 110 ? Elaborate one application of XTR 110 with suitable diagram. **9**

SECTION – II

7. Draw a test circuit of 4 digit LED programmable up-down counter 7217A and explain the following pin functions. **18**
   i) Equal
   ii) Zero
   iii) Store
   iv) Load counter
   v) Load register
   vi) Display counter.

OR

8. a) What are the features of 7107 (digital panel meter) ? Also explain principle of working as well as a typical application with suitable diagram. **9**

   b) What is concept of optical isolation ? What are features and practical applications of MCT2E (opto coupler) ? **9**

9. a) What are four problems that affect the performance of digital circuit if the PCB is not properly designed ? **8**

   b) What are the thumb rules followed for placement of components on printed circuit boards ? **8**

OR

10. a) Explain the rules followed for designing a printed circuit board layout for analog circuits. **8**

    b) Explain the flexible and multilayer PCB. **8**

11. a) What do you mean by catastrophic failures ? Explain with the help of "Bath tub curve". **8**

    b) What are traceability standards ? **8**

OR

12. a) What is necessity of calibration ? Explain the basic elements of calibration process. **8**

    b) What are the advantages of system simulation using virtual instrumentation ? Elaborate one application. **8**

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**[3863] – 91**

# T.E. (Printing) (Semester – I) Examination, 2010
# PRINTING NETWORKS AND COMPUTER GRAPHICS
# (2003 Course)

Time : 3 Hours Max. Marks : 100

***Instructions :*** *1) From Section **I** answer Q. **1** or Q. **2**, Q. **3** or Q. **4**, Q. **5** or Q. **6**. From Section **II** answer Q. **7** or Q. **8**, Q. **9** or **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) 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 UNIX operating system. Explain the multiuser and multitasking features of UNIX operating system. **8**

   b) Write short note on MAC operating system. Mention its use in printing industry. **8**

   OR

2. a) Classify the following DOS commands as internal and external commands. Explain with example. **8**

   COPY, TYPE, ATTRIB, FORMAT, DIR, DEL, REN, SORT.

   b) What is operating system ? Give the functions and features of operating system. **8**

3. a) Explain the OSI reference model in detail. **10**

   b) Explain IP addressing classes with examples. **8**

   OR

4. a) Write short notes on : **10**
      1) TCP/IP model
      2) Types of networks.

   b) Explain application of internet in printing industry. **8**

**P.T.O.**

5. a) What is internetworking ? Explain different internetworking devices. **8**

   b) What is ISDN ? State different services offered by ISDN. Explain any one service in detail. **8**

OR

6. a) Explain video-conferencing in detail. **8**

   b) Explain in detail VSAT. **8**

SECTION – II

7. a) Explain fundamentals steps involved interface image processing. **8**

   b) Explain : **8**

   1) Videoram. 2) Basic graphics system.

OR

8. a) Explain the terms bit, dot, pixel related to image. **8**

   b) Write short notes on following file formats : **8**

   1) BMP.
   2) TIFF.

9. a) Write short notes on (**any two**) : **10**

   1) CIP4. 2) PPF in workflow.
   3) Coding of PDF.

   b) Explain client-server architecture in detail. **8**

OR

10. a) What is workflow ? What are features of workflow system interface prepress ? **10**

    b) Explain the integration of prepress-press-postpress. **8**

11. a) Explain in detail. **8**

    1) OCR. 2) ICR.

    b) Explain the digital camera interface detail and its application in field of printing. **8**

OR

12. a) Write short notes on : **8**

    1) Scanners application in printing.
    2) Printers application in printing.

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

    1) Web camera. 2) Frame grabber card.

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# T.E. (Printing) (Semester – I) Examination, 2010
# PRINTING PROCESS INSTRUMENTATION
# (2003 Course)

Time : 3 Hours Max. Marks : 100

***Instructions :*** *1)* ***All*** *questions are* ***compulsory****.*
*2)* ***Neat*** *diagrams must be drawn* ***wherever*** *necessary.*
*3) Assume suitable data,* ***if required****.*

SECTION – I

1. a) State static and dynamic characteristics of instruments. Explain Accuracy, Precision, Resolution and Repeatability. **8**

   b) Define and explain different types of errors in measurement. **8**

   OR

2. a) Draw block schematic and explain Automatic control system. Explain any one application. **8**

   b) With neat block schematic, explain Electronic, Pneumatic and Hydraulic systems. State applications of each. **8**

3. a) Suggest suitable transducer for paper thickness measurement. Draw and explain with block schematic, the paper thickness measurement system. **8**

   b) Define Absolute and Relative Humidity. Explain any one method of Humidity measurement in detail. **8**

   OR

4. a) Explain the significance of Temperature, Strain and Acceleration in printing processes. Explain suitable measurement systems to measure these parameters. **8**

   b) State various methods of measurement of pressure below atmospheric pressure. Explain any one method in detail. **8**

**P.T.O.**

5. a) What is the application of sample and hold element in signal conditioning ? Draw and explain the working of sample and hold circuit. **8**

   b) Draw and explain Instrumentation Amplifier. Explain the application of IA in printing process. Derive the expression for overall gain. **10**

OR

6. a) Explain construction and working of LASCR. **8**

   b) Explain with relevant block schematic different applications of opto-devices in printing processes. **10**

SECTION – II

7. a) Draw and explain ON-OFF controller in detail. **8**

   b) With block schematic explain final control operation. **8**

OR

8. a) What are the different continuous controller modes ? Explain with applications in printing. **8**

   b) Define process Equation, Process Load, Process Lag and Control Lag. State significance of Dead Time. **8**

9. a) With block schematic, explain microprocessor based temperature control system. **8**

   b) Draw Pneumatic PD controller and explain its working. **8**

OR

10. a) Explain Electronic PID controller. **8**

    b) A proportional controller has scaling so that 0-10 V corresponds to 0-100% output. If $R_2$ = 10 K$\Omega$ and full scale error range is 10 V. Find the value of $V_0$ and $R_1$ to support 20% proportional band about 50% zero error controller output. **8**

11. a) Define Ladder Diagram. Which different symbols are used in Ladder diagram ? Draw the complete Ladder diagram for bottle filling plant. **10**

    b) Draw block schematic of Data Logger and explain its applications. **8**

OR

12. a) Explain the architecture of PLC. With example, explain the application of PLC in printing. **10**

    b) Explain SCADA system in detail. **8**

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**[3863] – 93**

# T.E. (Printing) (Semester – I) (2003 Course) Examination, 2010
# REPROTECHNIQUES

Time : 3 Hours Max. Marks : 100

SECTION – I

1. Explain types of originals in detail (at least 6). **18**

   OR

   Explain Basic requirements of originals. **18**

2. Compare between line processing and Halftone processing. **16**

   OR

   Explain structure of Halftone image in detail. **16**

3. Explain the significance of halftone process. **16**

   OR

   Explain the process of converting continuous tone to halftone. **16**

SECTION – II

4. Explain process of lith Film manufacturing. **16**

   OR

   Discuss in detail exposure and development of film. **16**

5. Explain basic dot formation concepts. **16**

   OR

   Compare AM and FM screening. **16**

6. Explain concept of dot gain and Dot Loss. **18**

   OR

   Explain Transmission Densitometer structure and working. **18**

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**[3863] – 94**

**T.E. (Printing) (Semester – I) Examination, 2010**
**(2003 Course)**
**DESIGN OF PRINTING MACHINE COMPONENTS**

Time : 3 Hours Max. Marks : 100

SECTION – I

1. a) Explain basic procedure of machine design. **8**

   b) What are the different standards use in design ? **8**

OR

1. a) Explain mechanical properties of engineering material. **8**

   b) Explain limit, fits and tolerances. **8**

2. a) Explain the term factor of safety and factors to be considered while selecting a factor of safety. **8**

   b) A knuckle joint is subjected to an axial load of 100 kN. Determine the diameter of knuckle pin consideration the load to be uniformaly distributed over the pin in the eye and uniformaly varying over the portion of pin in fork. Use the following data :

      i) Allowable tensile and compressive stress for pin = 600 $N/mm^2$

      ii) Allowable shear stress for pin = 300 $N/mm^2$

      iii) Allowable bearing pressure for pin = 200 $N/mm^2$

      iv) Thickness of eye = 1.5× pin diameter.

      v) Total fork thickness = eye thickness. **8**

OR

2. Design a cotter joint to transmit a load of 100 kN in tension or compression.

   Assume the following stresses for socket, spigot and cotter.

   i) Allowable tensile stress = 90 N/mm$^2$.

   ii) Allowable crushing stress = 170 N/mm$^2$.

   iii) Allowable shear stress = 60 N/mm$^2$. **16**

3. a) Explain ASME code for design. **8**

   b) State the procedure of designing a shaft as per the following approaches.

   i) Equivalent bending moment approach.

   ii) Rigidity approach. **10**

OR

3. It is required to design a bushed pin type flexible coupling to connect the output shaft of an electric motor to the shaft of a centrifugal pump. The motor delivers 20 kW power at 720 rpm. The starting torque of motor can be assumed to be 150% rated torque. Design the coupling and specify the dimensions of its components. Material used :

   1) Shaft $\rightarrow$40 C8 with Syt = 380 N/mm$^2$, F.S. = 2

   2) Key and pin $\rightarrow$ 30C8 with Syt = 400 N/mm$^2$

      F.S. = 2, Syc = 1.5 Syt.

   3) Pin $\tau$ = 35 N/mm$^2$ (IS 2693 – 1980)

   4) Flanges Sut – 200 N/mm$^2$. **18**

## SECTION – II

4. a) Explain the construction of recirculating ball screw. Give applications of it. **8**

   b) A screw clamp is used on the shop-floor is shown in figure. The screw has single start square threads of 22 mm nominal diameter and 5 mm pitch. The coefficient of friction at the threads and the collar is 0.15. The mean radius of the friction collar is 15 mm. The capacity of the clamp is 750 N. The handle is made of steel 30C8 (Syt = 400 N/mm$^2$). It can be assumed that the operator exerts a force of 20 N on the handle.

i) What torque is required to tighten the clamp to full capacity ?

ii) Determine the length and the diameter of the handle such that it will bend with a permanent set, when the rated capacity of the clamp is exceeded. **8**

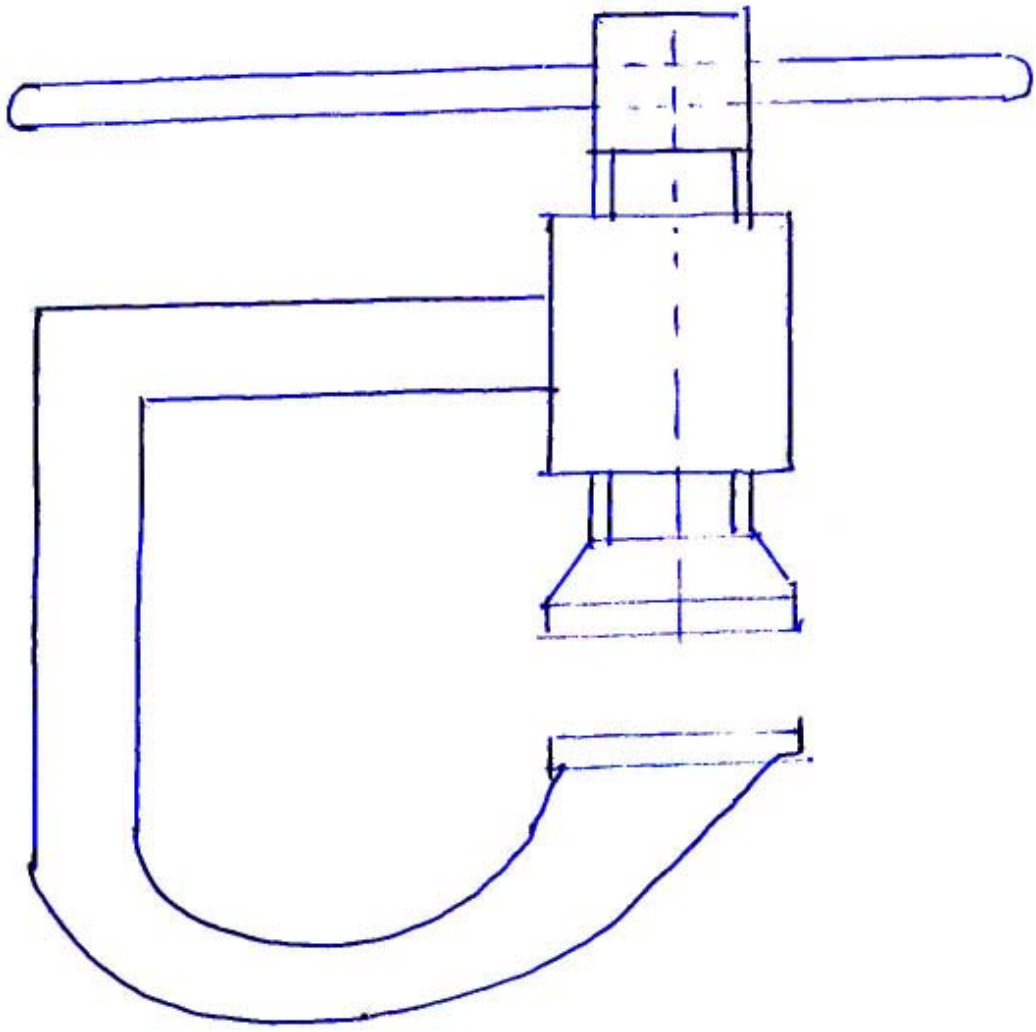
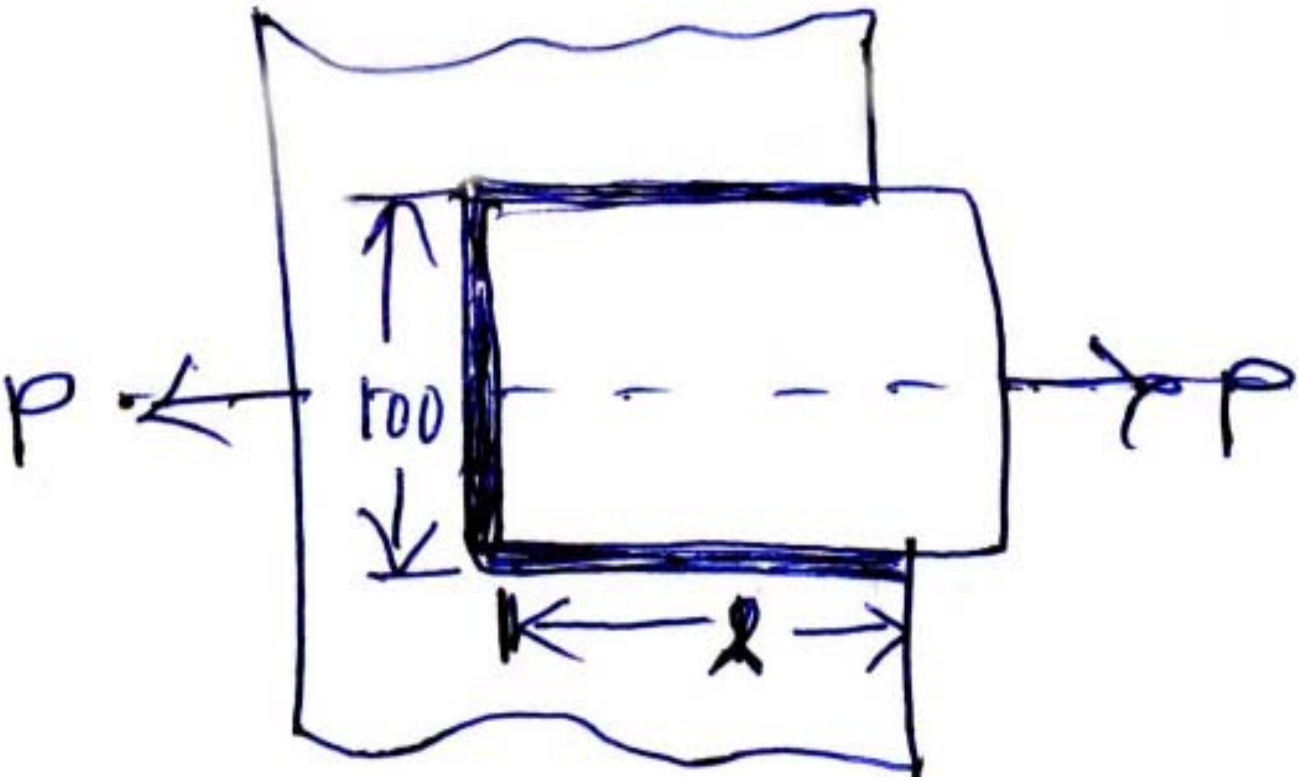


Fig = C- Clamp

OR

4. 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 diameters of screw collar are 55 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. Assuming uniform wear condition at the collar and allowable thread bearing pressure of 5.8 N/mm$^2$. Find :
   i) The torque required to rotate the screw
   ii) The stresses in the screw.
   iii) The height of nut. **16**

5. a) Explain basic types of screw fasteners. **8**
   b) A steel plate, 100 mm wide and 10 mm thick, is joined with another steel plate by means of a single transverse and double parallel fillet welds, as shown in figure. The strength of the welded joint should be equal to the strength of the plates to be joined. The permissible tensile and shear stresses for the weld material and the plates are 70 and 50 N/mm$^2$ respectively. Find the length of each parallel fillet weld. Assume the tensile force acting on the plates as static. **8**




Figure

OR

5. A solid rectangular shaft of cross-section 80mm × 50mm is welded by a 5mm fillet weld on all sides to a flat plate with axis perpendicular to plate surface. Find the maximum torque that can be applied to shaft, if shear stress in the weld is not to exceed 85 MPa. **16**

6. Write a short note on **(any three)** : **18**
   a) Types of springs.
   b) Wahl's Factor.
   c) Deflection equation for helical spring.
   d) Springs in series and parallel.

OR

6. A helical compression spring made up of circular wire is subjected to an axial force that varies from 2.5 kN to 3.5 kN. Over this range of force, the deflection of spring should be approximately 5 mm. The spring index can be taken as 5. The spring has square and ground ends. The spring is made up of cold bronze spring wire with ultimate tensile strength of 1050 $N/mm^2$ and modulus of rigidity of 81370 $N/mm^2$. The permissible shear stress for spring wire should be taken as 50% of ultimate tensile strength. **18**

   Design the spring and calculate
   i) Wire diameter.
   ii) Mean diameter.
   iii) Number of active coils.
   iv) Total No. of coils.
   v) Solid length of spring.
   vi) Free length of spring.
   vii) Required spring rate.
   viii) Actual spring rate.

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## T.E. (Printing) (Semester – I) Examination, 2010
## TECHNOLOGY OF PRINT FINISHING AND PACKAGING
## (2003 Course)

Time : 3 Hours Max. Marks : 100

***Instructions** : 1) Answer **all** questions begining on a **new** page.*
*2) Answer **1** of **each A** or **B**.*
*3) Question **1, 2, 4** and **5** carry **16** marks each. Question **3** and **6** carry **18** marks.*

SECTION – I

1. A) What is Print Finishing and what processes are included therein. Explain any one process in detail.

   B) Explain :

   Manufacture of a quarter bound book.

2. A) Explain the working of a paper cutting machine with suitable diagram ?

   B) What are the British sizes of paper ? Tabulate and also indicate multiples of the same.

3. A) The various types of Book Bindings. Explain in detail any one, with suitable diagrams ?

SECTION – II

4. A) What is packaging ?

   B) What is the relation of packaging with the printing industry ?

5. A) What is the pressure required for a punching die having a total cutting area of 200 running cms and total creasing area of 60 running cms ?

   B) What are the further finishing/additional processes involved in manufacture of boxes made of duplex board after printing.

6. A) What are the substrates used for flexible packaging ? Give details of processing any one with suitable diagram.

   B) Design a two piece carton with separate lid having the following dimensions width 12” Breadth 4” and height of 12”.

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**[3863] – 96**

# T.E. (Printing and Graphic Communication) (Sem. – II) Examination, 2010
# PRINTING TELECTRONICS AND OPTOELECTRONICS
# (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*** *books.*

*3) Neat diagram must be drawn* ***wherever*** *necessary.*

*4) Black figures to the* ***right*** *indicate* ***full*** *marks.*

*5)* ***All*** *questions carry* ***equal*** *marks.*

*6)* ***Use*** *of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is* ***allowed****.*

SECTION – I

1. A) What is pulse amplitude modulation ? Explain A.M. in details. **8**

   B) Explain role of optoelectronics in Printing Technology. **8**

OR

2. A) What is channel capacity ? Explain various data transmission channels. **8**

   B) What do you mean by modulation ? Explain pulse code modulation. **8**

3. A) Explain data encryption and decryption. **10**

   B) Explain Pulse width modulation with suitable diagram (waveforms). **8**

OR

4. A) Write short notes on :

   1) Time division multiplexing (TDM)

   2) Frequency division multiplexing (FDM). **10**

   B) State "Sampling theorem". Explain the importance of sampling in signal processing. **8**

5. A) Explain the problems of long distance transmission. **8**

   B) Write short notes on :

   1) Videotext

   2) Teletext. **8**

OR

6. A) What are different channel interferences ? Explain noise interface. **8**

   B) Explain companding using suitable diagram. **8**

SECTION – II

7. A) Explain any four types of optocouplers with the help of suitable diagrams. **8**

   B) Explain working principle of LASER with suitable diagram. **8**

OR

8. A) Explain working of LASER printer. **8**

   B) Distinguish between photodiode and avalanche photodiode. **8**

9. A) Draw and explain block diagram of basic fiber optic communication system. **10**

   B) Draw and explain different types of fiber optic cables. **8**

OR

10. A) Describe different losses in fiber optic cable with suitable diagrams. **10**

    B) Distinguish between step index and graded index fiber. **8**

11. A) Explain smart ticket application using RFID. **8**

    B) Explain Wi-Fi technology. **8**

OR

12. A) Explain any one application of RFID in field of printing in detail . **8**

    B) Explain sheet thickness measurement application. **8**

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**[3863] – 97**

# T.E. (Printing) (Semester – II) Examination, 2010
## SURFACE PREPARATION – I
## (2003 Course)

Time : 3 Hours Max. Marks : 100

***N.B.*** *: 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.*

SECTION – 1

1. a) Explain the following points to be considered while planning the job. **8**

   i) Size of the machine

   ii) Size of the plate

   iii) Size of the book

   iv) Quantity to be printed.

   b) Explain the method of preparing the layout for any job to be printed with suitable diagrams. **8**

OR

1. a) Draw the eight page imposition scheme with sheet work method and label the elements. **8**

   b) Draw the eight page imposition scheme with half sheet work method and label the elements. **8**

**P.T.O.**

2. a) List down the steps of preparing Water Deep etch plate in proper sequence. **8**

   b) Differentiate between Positive and Negative Pre Sensitized plate. **8**

OR

2. a) List down the steps of preparing Gum Deep etch plate in proper sequence. **8**

   b) Explain why Positive PS plates are called as Subtractive and Negative PS plates as Additive plates ? **8**

3. a) Explain the Driographic printing process with suitable diagram. **9**

   b) Explain the method of preparing the Toray plate. **9**

OR

3. a) Explain the method of preparing the Rubber plates used in Flexography. **9**

   b) Explain Water soluble photopolymer resin plate making. **9**

SECTION – 2

4. a) Explain the Polyester master computer to plate technology in detail. **8**

   b) Explain the use of Ctp in News paper industry. **8**

OR

4. a) What are the selection criterias of laser while designing the laser plate making system. **8**

   b) Suggest suitable Ctp technology for the commercial printing firm with proper justification. **8**

5. a) Explain various terminologies associated with the screen mesh. **8**

   b) Differentiate between direct and indirect method of preparing the screen. **8**

OR

5. a) Explain any one method of preparing the screen in detail with diagrams. **8**

   b) Explain in detail the application of each screen making method. **8**

6. a) Explain various elements of the colour control bar. **9**

   b) Find out the number of plates required to print the following job : Magazine. **9**

   Text pages : B/W : 96

   Cover page : Four colour : 04

   Size of the magazine : A4

   Size of the machine : $20'' \times 30''$

   Quantity to be printed : 3000.

   OR

6. a) Explain various environmental considerations to be observed in the plate making department. **9**

   b) Find out the number of plates required to print the following job : Magazine. **9**

   Text pages : two colour : 64

   Cover page : four colour : 04

   Size of the magazine : A4

   Size of the machine : $18'' \times 23''$

   Quantity to be printed : 1000

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