[4658] – 12

Seat No.	

T. E. (Mechanical and Automobile Engineering) (Semester – I) Examination, 2014
COMPUTER ORIENTED NUMERICAL METHODS
(2008 Pattern)

Time : 3 Hours Max. Marks : 100

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

SECTION – I

1. a) Using Newton's-Raphson's method, find the roots of the equation, $e^x = x^3 + \cos 25x$. **6**

   b) Draw the graphical representation of Successive Iterative method. **4**

   c) Calculate the value of following function by Simpson's 1/3rd rule using 11 ordinates.

   $$\int_0^{\pi/2} \sin x.dx.$$ **6**

OR

2. a) Apply the Simpson's 1/3rd rule to evaluate the integral, $\int_2^{2.6}\int_4^{4.4} \frac{dx.dy}{xy}$. **10**

   b) Draw the flow chart for Modified Newton's-Raphson's method. **6**

3. a) Use Lagrange's Interpolation formula to find the value of Y, when X = 10, **8**
   If the following values of X and Y are given,

X	5	6	9	11
Y	12	13	14	16

   b) Find the first and second derivatives of the f(x) at x = 105 if, **8**

x	1.5	2.0	2.5	3.0	3.5	4.0
f(x)	3.375	7.000	13.625	24.00	38.875	59.00

OR

P.T.O.

4. a) Find y' (0) and y" (0) from the following table, **8**

x	0	1	2	3	4	5
f(x)	4	8	15	7	6	2

b) Estimate the value of y(42) from the following available data, **8**

x	20	25	30	35	40	45
y	354	332	291	260	231	204

5. a) Solve the following equation by Gauss – Seidal method, **10**

$5x + 2y + z = 12$, $x + 4y + 2z = 15$, $x + 2y + 5z = 20$.

b) Draw the flow chart for Thomos algorithms for tridiagonal matrix method. **8**

OR

6. a) Solve the following equation by Gauss Elimination method, **12**

$2x + y + z = 10$, $3x + 2y + 3z = 18$, $x + 4y + 9z = 16$.

b) Explain partial complete pivoting with suitable example. **6**

SECTION – II

7. a) Explain following types of errors with suitable example **6**
   1) Inherent Error
   2) Rounding Error
   3) Truncation Error
   4) Algorithmic Error.

b) Fit a power curve $y = a \times b$ to the given data **10**

X	1	2	3	4	5	6
Y	2.98	4.26	5.21	6.10	6.80	7.50

OR

8. a) Explain Least Square Technique. Draw Flowchart and write a computer program for the same. **8**

b) Explain with suitable example. **8**
   i) Error Propagation
   ii) Concept of convergence.

9. a) Draw flow chart for 'Modified Euler's Method'. **6**

   b) Using 'Runge-Kutta method of order 4', find y at x = 0.1 and 0.2 for the following equation $dy/dx = x + y^2$, where y (0) =1 **10**

OR

10. a) Using 'Modified Euler's Method', find y at x = 0.2 and 0.4 for the following equation $dy/dx = y + e^x$, where y(0) = 0 for 2 decimal accuracy. **10**

    b) Draw flow chart for 'Euler's Method'. **6**

11. a) Draw flow chart to solve Parabolic Equation by Explicit Method. **8**

    b) Solve the Parabolic Equation $\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2}$ subject to condition

    $u(x, 0) = \sin \pi x,\ 0 \le x \le 1, u(0, t) = u(1, t) = 0$ using Crank-Nicolson method, do two iterations taking h = 1/3, k = 1/36. **10**

OR

12. a) Draw flow chart to solve Laplace Equation for given no of iterations. **8**

    b) Solve $y_{tt} = y_{xx}$ upto t = 0.2 with a spacing of 0.1 subject to y(0, t) = 0, y(1, t) = 0, $y_t(x, 0) - 0$ and y(x, 0) = 10 + x(1 – x). **10**

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Seat No.	

T. E. (Electrical) (Semester – I) Examination, 2014
POWER ELECTRONICS
(2008 Pattern)

Time : 3 Hours Max. Marks : 100

Instructions *: 1) Answers to the* ***two*** *Sections should be written in* ***separate*** *answer books.*
2) Answer ***any three*** *questions from* ***each*** *Section.*
3) Black figures to the ***right*** *indicate* ***full*** *marks.*
4) ***Neat*** *diagrams must be drawn* ***wherever*** *necessary.*
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 gate drive circuit for GTO. Discuss switching characteristics and give comparison between SCR and GTO. **8**
   b) Explain and compare R and RC firing circuit for SCR. **8**

OR

2. a) Draw gate characteristics of SCR. Explain how value of gate voltage and gate current can be selected. **8**
   b) Why SCR is called as current controlled device ? Define Latching current and Holding current. **8**

3. a) What are converters ? Explain with circuit diagram and waveforms working of 3ϕ half controlled converter with highly inductive load. Deduce the equation for o/p voltage. Plot W/Fs at $\alpha = 60°$. **10**
   b) Explain single phase dual converter. Draw waveforms for output voltage at $\alpha = 60°$ and $\alpha = 150°$. Comment on mode of operation of 1ϕ dual converter at 60° and 150°. **8**

OR

4. a) With neat circuit diagram and all necessary waveforms explain the working of three phase fully controlled bridge converter feeding RLE load. Explain modes of operation. **10**
   b) Write a note on selection of transformers and semiconductor devices for converters. **8**

5. a) Describe the working of a two stage sequence control of voltage controllers for R load. What is the advantage of this controller over 1ϕ full wave voltage controller ? **8**
   b) Discuss various technique adopted for protection of TRIAC and DIAC. **8**

OR

6. a) Explain static on load tap changing of transformer using a. c. regulators. Draw output voltage waveform using two stages. **8**

   b) Explain four mode operation of TRIAC. **8**

SECTION – II

7. A) Describe the switching characteristic of Power MOSFET and give applications with control requirements. **8**

   B) Give a comparison between MOSFET and IGBT. **8**

OR

8. A) Describe the basic structure of MCT. Give its equivalent circuit and explain the turn on and turn off process. **8**

   B) Explain output and transfer characteristics of IGBT. **8**

9. A) Explain four quadrant chopper feeding RLE load in detail. **8**

   B) What is time ratio control in dc choppers ? Explain the use of TRC for controlling the output voltage in choppers. **8**

OR

10. A) Explain the principle of operation of step up chopper. Derive expression for output voltage. **8**

    B) Draw a power circuit diagram for a type-A chopper. Show load voltage waveforms for $\alpha = 0.3$ and $\alpha = 0.8$. For both these duty cycles, calculate : the average and rms values of output voltage in terms of source voltage. **8**

11. A) What is a need for controlling the voltage at the output terminals of an inverter ? Describe and compare various methods employed for the control of output voltage of inverter. **9**

    B) What is pulse width modulation ? Explain any one PWM technique in detail. **9**

OR

12. A) Explain with circuit diagram and waveforms operation of single phase current source inverter. **8**

    B) Explain working of three phase six step voltage source inverter in 180° mode of operation. For star connected load draw output voltage waveforms. Show devices conducting in each step. **10**

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Seat No.	

T.E. (Printing) (Semester – I) Examination, 2014
COLOR MANAGEMENT AND STANDARDIZATION
(2008 Course)

Time : 3 Hours Max. Marks : 100

Instructions : *1) Answer to the **two** sections should be written in **separate** books.*
*2) **Neat** diagrams must be drawn **wherever** necessary.*
*3) **Black** figures to the **right** indicate **full** marks.*

SECTION – I

1. Answer **any two**. **18**
   A) Explain the additive theory and subtractive theory.
   B) Explain ink impurites.
   C) Explain the term gray balance and its importance.
2. Solve **any two**. **16**
   A) Explain trichromancy and opponency theory of human vision with neat diagram.
   B) Explain the human vision deficiency.
   C) Explain the term spectral power distribution graph for CIE standard illuminant.
3. Answer **any two**. **16**
   A) Explain CIE lab and LCh color system.
   B) Explain the munsell color system.
   C) Explain human matching function.

SECTION – II

4. Answer **any two**. **16**
   A) Explain the working principle of spectrophotometer.
   B) Explain the term colour difference and explain CIE LAB 76 and CIE 94 color difference equation.
   C) Explain the various elements that are used in visual colour measurement.
5. Answer **any two**. **16**
   A) Explain process profile, generic profile and custom profile.
   B) Explain monitor calibration and monitor profiling.
   C) Explain the test charts used for various printing.
6. Answer **any two**. **18**
   A) Explain the term calibration. Explain proofer calibration for any substrate with the help of starproof software.
   B) Workflow for press standardization for any process. Explain with example from pre press to press.
   C) Explain device dependent and device independent workflow.

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Seat No.	

T.E. (Petroleum) (Semester – I) Examination, 2014
NUMERICAL METHODS AND GEOSTATISTICS
(2008 Pattern)

Time : 3 Hours Max. Marks : 100

Instructions : *i) 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****.*

ii) Answers to the ***two*** *Sections should be written in* ***separate*** *answer books.*

iii) Black figures to the ***right*** *indicate* ***full*** *marks.*

iv) ***Neat*** *diagrams must be drawn* ***wherever*** *necessary.*

v) ***Use*** *of electronic pocket calculator is* ***allowed****.*

vi) Assune suitable data if ***necessary****.*

SECTION – I

1. a) Given f(z) = u + iv is an analytic function. Find u (x, y) if v (x, y) = 4 xy + cosxsinhy and express f(z) in terms of z. **6**

   b) Find the bilinear transform which maps 1, 0, i of the z – plane on to the points ∞ ,– 2, $\frac{-1}{2}(1+i)$ of the w – plane. **5**

   c) Evaluate $\oint_c \frac{e^{-2z}+\sin 2z}{\left(z-\pi/4\right)^3} dz$ where c is the contour $|z| = 2$. **5**

   OR

2. a) Prove that an analytic function f(z) with constant amplitude is a constant function. **6**

   b) Show that the transformation $w = \frac{z-4}{z+4}$ maps the right half of the z–plane into the unit circle $|w| < 1$. **5**

   c) Evaluate $\oint_c \frac{e^z + z^2}{(z-1)^2 (z-2)} dz$ where c is the contour $|z| = 3$. **5**

P.T.O.

3. a) Obtain regression lines for following data : **9**

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

b) The mean and standard deviation of 25 items is found to be 11 and 3 respectively. It was observed that one item 9 was in correct. Calculate the mean and standard deviation if **8**

i) The wrong item is omitted and

ii) It is replaced by 13.

OR

4. a) Compute correlation coefficient between supply and price of commodity using following data : **9**

Supply	152	158	169	182	160	166	182
Price	198	178	167	152	180	170	162

b) i) The first four central moments of distribution are 0, 2.5, 0.7 and 18.75. Comment on skewness and kurtosis.

ii) The first three moments about the value 5 are 2, 20 and 40. Find the second and third central moment. **8**

5. a) Number of road accidents on a highway during a month follows a Poisson distribution with mean 2. Find the probability that in a certain month number of accidents on the highway is 2 and 0. **6**

b) Assuming that the diameters of 1000 brass plugs taken consecutively from a machine form a normal distribution with mean 0.7515 cm and standard deviation 0.002 cm. How many of the plugs are likely to be approved if the acceptable diameter is 0.752 ± 0.004 cm.

[Area = 0.4878 when z = 2.25
Area = 0.4599 when z = 1.75]. **5**

c) A box contains 100 bulbs out of which 10 are defective. A sample of 5 bulbs is drawn. Find the probability that none is defective and all are defective. **6**

OR

6. a) The mean and variance of binomial probability distribution are 6 and 2 respectively. Find $P(r \geq 2)$ and $P(r = 1)$. **6**

b) In a Poisson's probability distribution if $3P(r = 4) = P(r = 5)$, then find $P(r = 6)$ and $P(r \geq 1)$. **5**

c) A problem in statistics is given to three students A, B and C where chance of solving it are $\frac{1}{2}, \frac{1}{3}$ and $\frac{1}{4}$ respectively. Find probability that all of them can solve the problem. **6**

SECTION – II

7. a) Establish the following :

i) $E = \left(\frac{\delta}{2} + \sqrt{1 + \frac{\delta^2}{4}} \right)^2$

ii) $\frac{1}{\nabla} y_n - \frac{1}{\Delta} y_0 = y_0 + y_1 + y_2 + ... y_n.$

iii) $1 + \delta^2 \mu^2 = \left(1 + \frac{1}{2} \delta^2 \right)^2$ **9**

b) Evaluate $\int_0^3 \frac{dx}{1+x}$ with 7 ordinates by using Simpson's $\frac{3}{8}^{th}$ rule and hence calculate log 2. **7**

OR

8. a) For the tabulated data :

x	50	51	52	53	54
f(x)	39.1961	39.7981	40.3942	40.9843	41.5687

Find f (50.5) and f (53.4). **9**

b) Evaluate $\int_0^{\pi} \frac{\sin^2 \theta}{5 + 4\cos\theta} d\theta$ **7**

by Simpson's $\frac{3}{8}^{th}$ rule, taking $h = \frac{\pi}{6}$.

9. a) Find the real root of the equation $x^3 + 2x - 5 = 0$ by applying Newton-Raphson method. Find the root at the end of fifth iteration. **8**

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

x	0	1	2	3	4	5	6
y	4	9	18	28	48	69	94

9

OR

10. a) Use Gauss-Seidel method to solve the system of equations

$9x_1 + 2x_2 + 4x_3 = 20$

$x_1 + 10x_2 + 4x_3 = 6$

$2x_1 - 4x_2 + 10x_3 = -15$

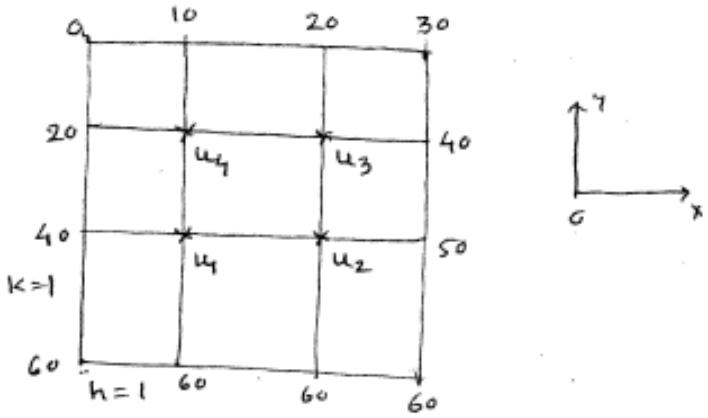
Find the solution at the end of fourth iteration. **8**

b) Use Runge-Kutta method of fourth order to solve the equation $\frac{dy}{dx} = \frac{1}{x+y}$ $[x_0 = 0, y_0 = 1]$ to find y at x = 0.4, taking h = 0.2. **9**

11. a) Solve the equation

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

with respect to the grid shown below.



8

b) Solve the following LPP by Simplex method.

Maximize $Z = 3x_1 + 6x_2 + 2x_3$

Subject to $3x_1 + 4x_2 + x_3 \leq 2$

$x_1 + 3x_2 + 2x_3 \leq 1$

and $x_1, x_2, x_3 \geq 0$ **9**

OR

12. a) Use explicit finite difference method to solve the equation

$$\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2}$$

subject to the conditions u (0, t) = 0, u (1, t) = 0

$u(x, 0) = 2x, \quad 0 \leq x \leq \frac{1}{2}$

$= 2(1 - x), \quad \frac{1}{2} \leq x \leq 1$

Taking $\delta x = 0.1$, $\delta t = 0.001$, find u at all the pivotal points at t = 0.001, 0.002, 0.003. **9**

b) Solve the following LPP by Simplex technique.

Maximize $Z = 6x_1 + 3x_2$

Subject to $2x_1 + x_2 \leq 8$

$3x_1 + 3x_2 \leq 18$

$x_2 \leq 3$

and $x_1, x_2 \geq 0$. **8**

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Seat No.	

T. E. (Info. Tech.) (Semester – I) Examination, 2014
SOFTWARE ENGINEERING
(2008 Course)

Time : 3 Hours Max. Marks : 100

Instructions *: 1) Answers to the* ***two sections*** *should be written in* ***separate*** *answer books.*
2) Answer ***any three*** *questions from* ***each section****.*
3) Neat diagrams must be drawn ***wherever*** *necessary.*
4) Figures to the ***right*** *side indicate* ***full*** *marks.*
5) ***Use*** *of calculator is* ***allowed****.*
6) Assume suitable data ***if necessary****.*

SECTION – I

1. a) Define software engineering. Explain the failure curve of software. Explain in detail the following software myths : **10**
   1) Management myths
   2) Customer myths
   b) Explain software spiral process model. **6**

OR

2. a) Explain in detail extreme programming. **8**
   b) Explain the umbrella activities of software process in detail. **8**
3. a) Explain Domain analysis. Discuss in short data objects, cardinality and modularity in data models. **8**
   b) Explain the requirement elicitation process. **8**

OR

4. a) Draw a level 0, level 1 and level 2 DFD for a library book issuing system for a college student. **7**
   b) Explain the class based elements of analysis model in detail. **9**
5. a) In the context of software design, explain the following in brief : **8**
   1) Information hiding
   2) Refactoring
   b) Explain the golden rules used for user interface design. **8**
   c) List the various elements that make up the design model of any system. **2**

OR

6. a) Explain all architectural styles in detail. **10**
   b) Explain the web design pyramid. What are interface design principles for web application ? **8**

SECTION – II

7. a) What are the objectives of unit testing ? How is unit testing carried out ? **8**
   b) Compare and contrast integration testing for conventional and object oriented software. **8**

OR

8. a) What is black box testing ? Explain the ways to perform black box testing. **8**
   b) What are the testing strategies for web application ? Explain the testing process for web application. **8**
9. a) Explain the FP based Estimation Decomposition Technique. **8**
   b) Explain decision tree to support make-buy decision with an example. **8**

OR

10. a) What is empirical estimation model ? Explain with any one technique. **8**
    b) What is the relevance of four P s in project planning ? Explain in detail. **8**
11. a) What is risk mitigation, risk monitoring, risk management ? Explain in brief. **10**
    b) Define SCM. What are the contents of SCM repository ? **8**

OR

12. a) What are the software quality factors ? Explain any four. **12**
    b) Explain the various steps involved in change control process. **6**

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Seat No.	

T.E. (Civil) (Semester – I) Examination, 2014
STRUCTURAL DESIGN – I
(2008 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 should be drawn **wherever** necessary.*

*4) Figure to the **right** indicates **full** marks.*

*5) Take f_e **410** grade of steel.*

6) Take ultimate stress in bolt, f_{ub} = 400 N/mm^2.

*7) Use electronic pocket calculator **IS : 800-2007** and steel table is **allowed**.*

*8) Use of cell phone is prohibited in the examination **hall**.*

SECTION – I

1. a) Explain in brief different type of steel structures with sketches. **8**

   b) Design a tension members using two unequal angle section connected back to back on each side of 10 mm thick gusset plate to carry an axial tension of 300 kN. Use M_{20} black bolts of 4.6 grades for connection and draw the design sketches. **17**

OR

2. a) Draw stress distribution diagram for the classification of cross section and classify the following section. **12**
   a) ISHB 450 @ 87.2 kg/m
   b) ISLC 200 @ 20.6 kg/m
   c) ISA 90 × 90 × 6 mm @ 8.2 kg/m
   d) ISA 150 × 115 × 8 mm @ 16.2 kg/m.

   b) Determine design strength of tension member of roof truss consist of 2-ISA 90 × 90 × 8 mm @ 10.8 kg/m, back to back on both side of 10 mm thick gusset plate connected by fillet weld. **13**

3. a) Determine the maximum design strength of built up column consist of two ISMC 250 @30.4 kg/m placed back to back. Length of column is 5 m. One end of the column is fixed and other end is pinned. **10**

P.T.O.

b) Design a gusseted base for a column section ISHB 350 @ 72.4 kg/m carrying an axial factored load of 1500 kN. The column is to be supported on concrete pedestal of M_{20} grade. Using M_{20} black bolts of 4.6 Grade, design connection and draw the design sketches. **15**

OR

4. a) Design compression member using single equal angle section subjected to a factored load of 220 kN. Unsupported length of the member is 2.1 m. Design the connection using fillet weld and draw the design details. **10**

b) Design a built-up column 10 m long to carry a factored load of 1000 kN. The column is restrained in position but not in direction at both ends. Design the column using two channels placed face to face and single lacing with welded connection. Draw the design sketches. **15**

SECTION – II

5. a) A simply supported beam of effective span 6 m carries a uniformly distributed load of w kN/m throughout the span. The beam is also loaded with two point load of 600 kN at 2 m from either support. The compression flange is laterally supported throughout the span. Determine the intensity of uniformly distributed load w so that the section ISMB 500 @ 86.9 kg/m provided for beam can carry safely. Check the case of high or low shear. **15**

b) Design a seated connection for a factored beam end reaction of 110 kN. The beam section is ISMB 250@ 37.3 kg/m connect to the flange of column section ISHB 200@ 37.3 kg/m using bolted connection. **10**

OR

6. a) Design laterally unsupported beam using suitable I-section for a simply supported ends of span 6 m carting a dead load 20 kN/m and an imposed load 40 kN/m. The ends are fully restrained against torsion and warping is unstrained in both flanges. Check for shear and deflection. **15**

b) Designs a framed connection to connect an ISLB 350 @ 49.5 kg/m transmit an end reaction of 450 kN to the web of ISMB 550 @ 103.7 kg/m. Design connection using fillet weld. **10**

7. a) A simply supported plate girder of effective span 20 m is subjected to factored load 60 kN/m. The compression flange of plate girder is laterally supported throughout the span.
Design the cross section of the plate girder for the following conditions. **25**
   a) Without any stiffener.
   b) With end stiffeners only.
   c) With end as well as intermediate transverse stiffeners.

OR

8. a) Explain codal provision to determine the panel point dead, live and wind load for an industrial truss. **8**

   b) Design the members U_2U_3, U_2L_3 and L_2L_3 for the truss as shown in Fig. 8 b. for the given panel point load. **17**

   Dead load : 8 kN

   Live load : 10 kN

   Wind load : 25 kN (Suction).

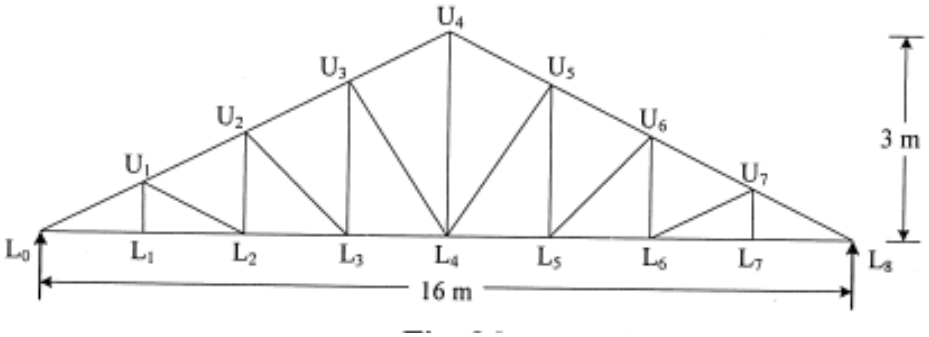

Fig. 8b

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Seat No.	

T.E. (Mechanical) (Semester – I) Examination, 2014
HEAT TRANSFER
(2012 Course)

Time : 3 Hours Max. Marks : 70

Instructions : *1) Solve 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****.*
2) Draw ***neat*** *diagrams* ***wherever*** *necessary.*
3) ***Use*** *of scientific calculator is* ***allowed****.*
4) Assume suitable data wherever ***necessary****.*
5) Figures to the ***right*** *indicate* ***full*** *marks.*

1. Derive a general three dimensional heat conduction equation in Cartesian coordinate system. Reduce it as
   a) Poisson equation
   b) Fourier equation and
   c) Laplace equation. **10**

OR

2. a) List two examples of heat conduction with heat generation. **2**
   b) A long cylindrical rod of daimeter 200 mm with thermal conductivity of 0.5 W/mK experiences uniform volumetric heat generation of 24000 W/m^3. The rod is encapsulated by a circular sleeve having an outer daimeter of 400 mm and a thermal conductivity of 4 W/mK. The outer surface of sleeve is exposed to cross flow of air at 27°C with a convection coefficient of 25 W/m^2K. Find the temperatures at the interface between the rod and sleeve and on the outer surface. What is the temperature at the centre of the rod ? **8**

3. a) What do you mean by response of thermocouple ? **2**
   b) A thermocouple junction of spherical form is to be used to measure the temperature of a gas stream. The junction is initially at 20°C and is placed in gas stream which is at 200°C. Determine the junction diameter needed for the thermocouple to have thermal time constant of 1 second. Also calculate the time required for the thermocouple to reach temperature of 197°C. Assume thermophysical properties as

   k = 20 W/mK, h = 350 W/m^2K, C = 400 J/kgK, ρ = 8000 kg/m^3. **8**

OR

4. a) Hot water is to be cooled as it flows through the tubes exposed to atmospheric air. Fins are to be attached in order to enhance heat transfer. Would you recommend attaching the fins inside or outside the tubes ? Why ? **4**
   b) A steel rod (k= 30 W/m°C) 1cm in diameter and 5 cm long protrudes from a wall which is maintained at 100°C. The rod is exposed to an environment with temperature 30°C and h = 50 W/m^2K. Calculate fin efficiency, temperature at the tip of fin and rate of heat dissipation from the base of the fin. Assume insulated tip condition, for fin analysis. **6**

P.T.O.

5. a) Define and give the significance of dimensionless numbers used in Convection. **8**

   b) Liquid mercury flows at a rate of 1.6 kg/s through a copper tube of 20 mm daimeter. The mercury enters the tube at 15°C and leaves at 35°C. Calculate the tube length if the tube wall temperature is 50°C. The properties of mercury at 25°C are **8**

   ρ = 13582 kg/m^3, Cp = 140 J/kgK, k = 8.69 W/mK, $\upsilon = 1.5 \times 10^{-7}$ m^2/s, Pr = 0.0248

   Use Nu = 7 + 0.025 (RePr)$^{0.8}$.

   OR

6. a) Differentiate between Biot number and Nusselt number. **4**

   b) Calculate the coefficient of heat transfer by free convection and the maximum current intensity for a nichrome wire 2.5 mm in diameter with the condition that its temperature should not exceed 95°C. The wire is exposed to still air at 25°C and the resistance per metre length of the wire is 6 ohm/m. Use Nu = 1.18 (GrPr)$^{1/8}$. The properties of air at 60°C are $\upsilon = 18.97 \times 10^{-6}$ m^2/s, Pr = 0.696, k = 0.02896 W/mK. **8**

   c) Explain concept of thermal boundary layer. **4**

7. a) What is a gray body ? How does it differ from a black body ? What is a diffuse gray surface ? **4**

   b) The outlet header of a high pressure steam superheater consists of a pipe (ε = 0.8)of diameter 27.5 cm. Its surface temperature is 500°C. Calculate the loss of heat per unit length by rediation if it is placed in a large enclosure at 30°C. If the header is now enveloped in a steel screen of daimeter 32.5 cm and emissivity 0.7 and the temperature of the screen is 240°C, find the reduction in heat by radiation. **8**

   c) Write the statements and mathemetical expressions of the following laws in radiation heat transfer : **6**

   a) Planck's law
   b) Wien's law
   c) Kirchhoff's law.

   OR

8. a) What do you mean by radiation shape factor ? List any 4 properties/ rules of radiation shape factor. **6**

   b) A furnace of boiler is laid from fire clay brick with outside lagging form plate steel. The distance between the two is quite small compared with the size of the furnace. The brick setting is at an average temperature of 365 K while the steel lagging is at 290 K. Calculate radiation heat transfer per unit area. Assume ε_{brick} = 0.85 and ε_{steel} = 0.65. What will be the reduction in heat loss if a steel screen having an emissivity value of 0.6 on both the sides is placed between the brick and the steel setting ? Also calculate the desired emissivity of the screen if the radiation loss is to be limited to 100 W/m^2. **10**

   c) A black body emits radiation of maximum intensity at a wavelength of 0.5 μm. Calculate its surface temperature and emissive power. **2**

9. a) Draw a labeled sketch of pool boiling curve. Explain the following terms with reference to this curve :
   a) Nucleate boiling
   b) Critical heat flux. **8**

   b) Two fluids 'A' and 'B' exchange heat in a counter flow heat exchanger. Fluid 'A' enters at 420°C and has a mass flow rate of 1 kg/s. Fluid 'B' enters at 20°C and has a mass flow rate of 1 kg/s. The effectiveness of heat exchanger is 75%.
   Determine :
   i) heat transfer rate and
   ii) the exit temperature of fluid 'B'. Specific heat of fluid 'A' is I kJ/kgK and that of the fluid 'B' is 4 kJ/kgK. **4**

   c) Define NTU and effectiveness of heat exchanger. **4**

OR

10. a) Establish expression for LMTD for counter flow heat exchanger. **8**

    b) Engine oil (Cp = 2100 J/kg°C) is to be heated from 20°C to 60°C at a rate of 0.3 kg/s in a 2 cm diameter thin walled copper tube by condensing steam outside at a temperature of 130°C (hfg = 2174 kJ/kg). For an overall heat transfer coefficient of 650 W/m^2 °C, determine the rate of heat transfer and the length of the tube required to achieve it. **6**

    c) Consider a water-to-water double-pipe heat exchanger whose flow arrangement is not known. The temperature measurements indicate that the cold water enters at 20°C and leaves at 50°C, while the hot water enters at 80°C and leaves at 45°C. Do you think this is a parallel-flow or counter-flow heat exchanger ? Justify your answer. **2**

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Seat No.	

T.E. (Chemical) (Semester – I) Examination, 2014
CHEMICAL ENGINEERING MATHEMATICS
(2012 Course)

Time : 3 Hours Max. Marks : 70

***Instructions** : 1) **Neat** diagrams must be drawn **wherever** necessary.*
*2) Black figures to the **right** indicate **full** marks.*
*3) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is **allowed**.*
*4) Assume suitable data, if **necessary**.*

1. a) Using bisection method find the root of the equation $X^3 - 1.8X^2 - 10X + 17 = 0$ that lies between the interval (1, 2) at the end of 2^{nd} iteration. **5**

   b) Using Newton Raphson method and taking initial guess as zero. Find $X^3 - 5X + 3 = 0$. Perform two iterations only. **5**

OR

2. a) Solve the following system of equations using Gauss Elimination method with partial pivoting. **5**

   $x + y + z = 6$
   $3x + 3y + 4z = 20$
   $2x + y + 3z = 13$

   b) Solve the following equations using Gauss Jordon method. **5**

   $x + y + z = 90$
   $x + 3y + 6z = 370$
   $3x - 8y - 4z = -340$

3. a) From the given data find the value of y at x = 4.5. **5**

x	1	2	3	4	5
y	2.38	3.65	5.85	9.95	14.85

   b) Evaluate $\log_e 7$ (logarithm of 7 to base e) by Simpson's $1/3^{rd}$ rule. **5**

OR

P.T.O.

4. a) Solve the following equations using Gauss Seidal method. (perform 2 iterations only) **5**

$4x + y + z = 5$

$x + 6y + 2z = 19$

$x + 2y + 5z = -10$

b) The following data are from the steam table **5**

Temperature °c	140	150	160	170
Pressure Kgf/Cm^2	3.685	4.854	6.302	8.076

Using Newtons backward formula find the pressure of steam for temperature of 142°C.

5. a) Explain the graphical interpretation of Eulers method. **8**

b) Solve the differential equation $dy/dx = 1 + xy$ at $x = 0.1$ and $x = 0.2$ using modified Euler's method subject to boundary condition $y(0) = 1$ upto accuracy of 0.001. **8**

OR

6. a) Discuss the stability region of Runge Kutta method. **8**

b) Solve the following equation by Runge-Kutta 4th order method at $x = 0.8$. **8**

$dy/dx = y - x$

Take $x_0 = 0$, $y(0) = 2$, $h = 0.2$.

7. Solve the boundary value problem **16**

$d^2y/dx^2 + y = 0$ with boundary conditions

$y = 0$ when $x = 0$

$y = 0$ when $x = 1$. Find y at $x = 0.5$.

OR

8. A steel plate of 750 × 750 mm has its two adjacent sides maintained at 100 degree C. While the two other sides are maintained at 0 degree C. What will be the steady state temperature at interior points assuming a grid size of 250 mm ? **16**

9. Suppose that a gas processing plant receives a fixed amount of raw gas each week. The raw gas is processed into two grades of heating gas, regular and premium quality. These grades of gas are in high demand and yield different profit to the company. However there production involves both time and on-site constraints. For example only one of the grade can be produced at a time and the facility is open for only 80 hrs/week. Further there is limited on site storage for each of the products. All factors are listed below. **18**

	Product		
Resource	**Regular**	**Premium**	**Resource Availability**
Raw gas	7 m^3/tonne	11 m^3/tonne	77 m^3/week
Production time	10 hr/tonne	8 hr/tonne	80 hr/week
Storage	9 tonnes	6 tonnes	
Profit	150/tonne	175/tonne	

Develop a linear programming formulation to maximize the profits for this operation.

OR

10. a) Explain the scanning and bracketing procedures for optimization of unconditional functions of one dimensional search. **10**

    b) What are the six steps of Optimization ? **8**

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Seat No.	

T.E. (Information Technology) (Semester – I) Examination, 2014
DATABASE MANAGEMENT SYSTEMS
(2012 Pattern)

Time : 3 Hours. Max. Marks : 70

1. a) Explain good database design properties. With suitable example explain the consequences of bad designing. **5**

   b) Explain with suitable example SQL aggregate functions. **5**

   OR

2. a) Define serializable schedule. Explain two forms of serializability. **5**

   b) What is a relation ? What are the properties of relation ? Explain with example. **5**

3. a) Explain the following extended entity relationship features of E-R model. **5**

   i) specialization ii) generalization

   iii) aggregation iv) attribute inheritance

   b) Explain rigorous two phase locking protocol. **5**

   OR

4. a) What is a deadlock ? Explain deadlock recovery techniques. **4**

   b) Write the syntax for following SQL commands : **6**

   i) create table ii) alter table iii) drop table

   iv) insert v) delete vi) update

5. a) Explain characteristics and advantages of distributed systems. **8**

   b) Detail the procedure for connectivity of MongoDB with Java. **8**

   OR

6. a) Explain the need of data fragmentation and types of fragmentation. **8**

   b) Explain the speed-up and scale up issues with respect to parallelism. **8**

7. a) Draw and explain basic building blocks of Hadoop. **8**

   b) Describe XML data model. List the advantages of XML. **8**

   OR

P.T.O.

8. a) Explain various components of Hadoop. **8**

   b) Write a short note on : **8**

      i) XQuery ii) JSON

9. a) Draw and explain main components of data warehouse and its characteristics. **9**

   b) What are the characteristics of NoSQL cloud databases ? **9**

      OR

10. a) What are the requirements of mobile databases ? List existing mobile dbs. **9**

    b) What is a decision support system ? Explain storage and data retrieval issues related to it. **9**

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Seat No.	

T. E. (Electronics) (Semester – I) Examination, 2014
FEEDBACK CONTROL SYSTEMS
(2008 Course)

Time : 3 Hours | Max. Marks : 100

Instructions *: 1) Answer to the* ***two*** *Sections should be written in* ***separate*** *answer books.*

2) Answer ***any three*** *questions from* ***each*** *Section.*

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 transfer function of DC motor position control system. **8**

   b) Find transfer function for S. F. G shown below. **8**

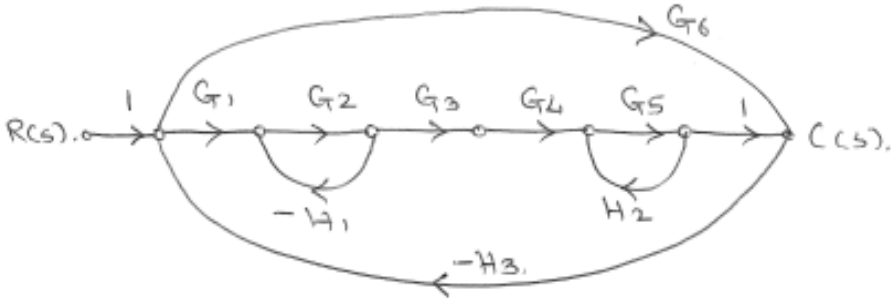

Fig. 1

OR

2. a) Distinguish between

   i) Block diagram method and signal flow graph method.

   ii) Open loop and closed loop system. **8**

b) Determine transfer function C(s)/R(s) from given diagram. **8**

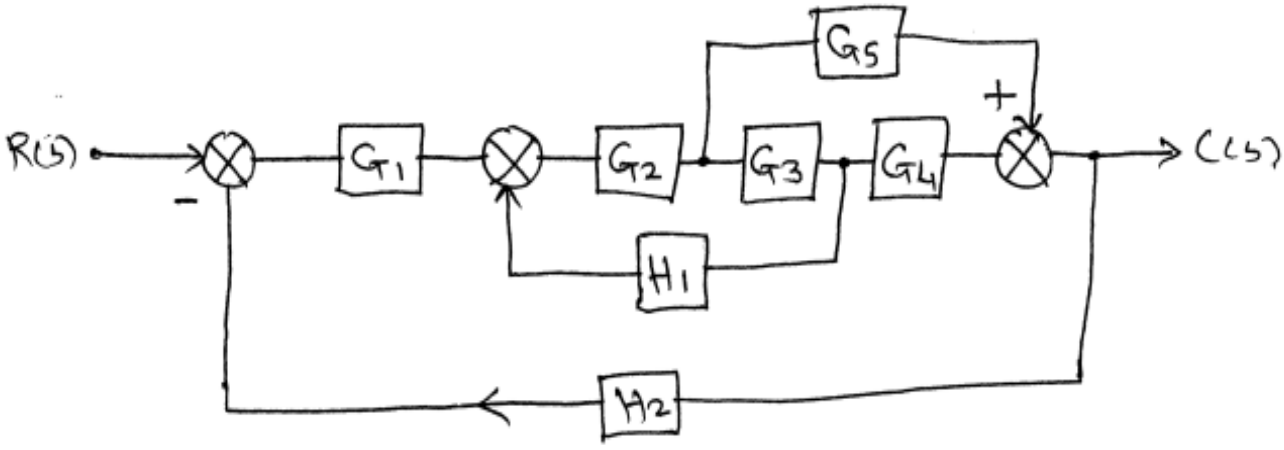

Fig. 2.

3. a) State Routh's criteria. A unity feedback control system has

$$G(s)=\frac{K}{s(s+10)(s^2+4s+5)}$$ **8**

Find the range of k for the stability of the system using Routh's criteria.

b) For a unity feedback system having open loop transfer function. **8**

$$G(s)=\frac{K(s+2)}{s(s^3+7s^2+12s)}.$$

Find :

i) Type of the system

ii) Static error coefficients

iii) Steady state error for an input $(R/2).t^2$

OR

4. a) The open loop transfer function of system is G(s). H(s) = K (S + 4)/(S + 2)(S +3). **10**
Determine complete root locus and comment on stability of control system.

b) What are static error coefficients ? Derive formula for each. **6**

5. a) A unity feedback control system has open loop transfer function as :

$$G(s)=\frac{100}{s(1+0.1s)(1+0.2s)}.$$

Sketch bode plot and determine from it :

i) Gain crossover frequency

ii) Phase crossover frequency

iii) Gain margin

iv) Phase margin

v) Closed loop stability of a system. **12**

b) Write short note on Frequency Domain Specifications. **6**

OR

6. a) A unity feedback control system has open loop transfer function as :

$$G(s)H(s)=\frac{s+1}{s^2(s-4)}.$$

Sketch the Nyquist plot and determine the stability of the closed loop system. **12**

b) State and explain “Mapping Theorem”. **6**

SECTION – II

7. a) Define the terms. **8**

1) State

2) State variables

3) State vector

4) State space

b) Find out transfer function of state model given by

$$\dot{X}=A\bar{X}+Bu$$

$$Y=C\bar{X}+Du$$

Where

$$A=\begin{bmatrix}1 & 0 & 0\\ 0 & -1 & 0\\ 0 & 0 & -3\end{bmatrix}\ B=\begin{bmatrix}3\\ -6\\ 3\end{bmatrix}\ C=[1\ \ 1\ \ 1]\ 0=[0].$$ **8**

OR

8. a) The state equations of a linear time invariant system are as given below :

$$\begin{bmatrix}\dot{X}_1\\ \dot{X}_2\end{bmatrix}=\begin{bmatrix}-2 & 0\\ 1 & -1\end{bmatrix}\begin{bmatrix}X_1\\ X_2\end{bmatrix}+\begin{bmatrix}0\\ 1\end{bmatrix}u(t);t>0.$$ **8**

i) Is the system controllable ?

ii) Compute the state transition matrix.

b) Write short note on controllability and observebility. **8**

9. a) What is PLC ? Draw and explain architecture of PLC. **8**

b) State controller equations for the P, P + I, P + D and PID control actions. **4**

c) Draw a response of a PID controller for :

i) Unit step input

ii) Unit ramp input. **6**

OR

10. a) Explain PD control mode, stating its characteristics. **8**

b) Draw a ladder diagram for an elevator system. **10**

11. a) What are the basic steps involved in the design of a fuzzy controller ? Explain with suitable example. **8**

b) Distinguish between feed forward neural network and recurrent neural network. **8**

OR

12. a) What is fuzzy set and membership function ? Explain with suitable example. **8**

b) Write a short note on Artificial Neural Networks. **8**

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Seat No.	

T. E. (Instrumentation and Control) (Semester – I) Examination, 2014
INSTRUMENTATION FOR CHEMICAL ANALYSIS
(2008 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) Figures to the ***right*** *indicate* ***full*** *marks.*
5) Assume suitable data, ***if*** *necessary.*

SECTION – I

1. a) What are the advantages and disadvantages of Instrumental Method over classical method ? **8**
   b) With suitable diagram explain Potentiometric electro-analytical method of chemical analysis. **8**

OR

2. a) Differentiate Classical method and Instrumental method for chemical analysis on the basis of merits and demerits. **8**
   b) Explain principle and experimental setup for Conductometry. **8**
3. a) Explain single beam UV-V is Spectrophotometer with neat sketch. **8**
   b) What are the laws of Photometry ? Derive mathematical expression to combine all the laws and their deviation. **10**

OR

4. a) Draw block diagram of AAS and explain function of each component. **10**
   b) Explain operation of Ultrasonic nebulizer used in AAS with neat sketch. **8**
5. a) Explain the principle and working of FTIR spectrophotometer with the help of suitable block diagram. **8**
   b) Explain with neat sketch flame photometer. **8**

OR

6. a) Enlist various sources and detector used for IR spectroscopy. Explain any 1 detector with neat sketch. **8**
   b) Write short notes on (**any two**) :
      a) Discharge Type atomiser
      b) Inductively Coupled plasma source
      c) Integral burner used in flame photometer. **8**

P.T.O.

SECTION – II

7. a) Explain with neat sketch Ratio flouriometer. **8**

   b) Explain with neat sketch explain any one application of Raman spectrometer. **8**

OR

8. a) Explain with neat sketch Raman spectrometer. **8**

   b) Explain CO_2 Gas analyser with neat sketch. **8**

9. a) Enlist different types of mass spectrometer. Explain working principle of magnetic deflection type mass spectrometer. **10**

   b) Define retention time and retention volume in GC. Explain with neat sketch Flame Ionization detector with neat sketch. **8**

OR

10. a) Enlist and explain various factors affecting separation in Gas Chromatography. **10**

    b) With neat sketch explain Pump system used in HPLC system. **8**

11. a) State and prove Braggs law of X-ray diffraction. **8**

    b) What is ESCA ? Explain in brief Auger emission spectroscopy. **8**

OR

12. a) Explain with a neat sketch Geiger-Muller Counter. **8**

    b) Write a short notes on (**any two**) :
       a) Scintillation Counter
       b) GC-MS
       c) Electron capture detector. **8**

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Seat No.	

T.E. (Chemical Engineering) (Semester – I) Examination, 2014
CHEMICAL ENGINEERING MATHEMATICS
(2008 Course)

Time : 3 Hours Max. Marks : 100

SECTION – I

1. a) Final real root of equation $x^3 - x - 1 = 0$ using bisection method with error less than 0.5%. **8**

   b) Find real root of equation $x^3 - 2x - 5 = 0$ using false position method with error less than 0.01 (Take initial guesses 2 and 3). **8**

   OR

2. a) Solve the equation $x - \cos x = 0$ using Newton-Raphson method with error less than 0.01. **8**

   b) Solve the equation $xe^x - \cos 3x - 0.51 = 0$ using secant method with $x_0 = 0$, $x_1 = 1$, $x = 4$. **8**

3. a) Solve the following system of equations using Gauss elimination method $2x_1 - x_2 = 7$, $-x_1 - 2x_2 - x_3 = 1$, $-x_2 + 2x_3 = 1$. **8**

   b) Solve the following system of equations using Gauss-Jordan method :
   $2x_1 + 3x_2 - 4x_3 = 1$, $5x_1 + 9x_2 + 3x_3 = 17$, $-8x_1 - 2x_2 + x_3 = -9$ **8**

   OR

4. a) Solve the following system of equations using LU decomposition method :
   $2x + 3y + z = 9$, $x + 2y + 3z = 6$, $3x + y + 2z = 8$. **10**

   b) Solve the following system of equations using Gauss-Seidal method :
   $3x_1 - 0.1x_2 - 0.2x_3 = 7.85$, $0.1x_1 + 7x_2 - 0.3x_3 = -19.3$, $0.3x_1 - 0.2x_2 + 10x_3 = 71.4$. **6**

5. a) Use least square regression to fit a straight line to the following data :

x	0.1	0.2	0.3	0.4	0.5	0.6
y	5.1	5.3	5.6	5.7	5.9	6.1

   9

   b) Fit a second-order polynomial to the following data :

x	0	1	2	3	4	5
y	2.1	7.7	13.6	27.2	40.9	61.1

   9

   OR

P.T.O.

6. a) Fit a curve $y = ae^{bx}$ to the following data using least square method :

x	0.1	0.2	0.3	0.4
y	1.832	2.238	2.733	3.338

9

b) Fit equation $y = a_0 + a_1x_1 + a_2x_2$ to the following data :

$\mathbf{x_1}$	0	2	2.5	1	4	7
$\mathbf{x_2}$	0	1	2	3	6	2
y	5	10	9	0	3	27

9

SECTION – II

7. a) Solve the ODE $y' + y = 0$ with y(0) = 1 using Euler's method. Take h = 0.1 and calculate y(0.1), y(0.2), y(0.3), y(0.4). **8**

b) Solve the ODE $y' = y - x$ with y(0) = 2 using fourth-order Runge-Kutta method. Take h = 0.1 and calculate y(0.1) and y(0.2) correct to 4 decimal places. **8**

OR

8. a) Solve the ODE $y' = x^2 + 1$ with y(0) = 1 using modified Euler's method. Take h = 0.05 and calculate y(0.05) and y(0.1) correct to 4 decimal places. **8**

b) Solve the ODE $y' = \sqrt{x^2 + 4}$ with y(0.4) = 0.41 using fourth-order Runge-Kutta method. Take h = 0.2 and evaluate y(0.6), y(0.8). **8**

9. a) State Laplace equation representing 2-dimensional heat flow problem for heated metal plate without any sources or sinks. Using finite difference approximations for derivative terms in the equation, derive standard 5-point formula and diagonal 5-point formula for solving this equation. Represent the formulae with suitable diagram. **8**

b) A steel plate of 750 mm × 750 mm has two adjacent sides maintained at 100°C while the other two sides are maintained at 0°C. Draw square grids for side 250 mm inside the plate and calculate steady-state temperatures at grid points T_1(250, 250), T_2(500, 250), T_3(500, 500), T_4(250, 500). (The numbers given in bracket represent position of grid points in mm). **8**

OR

10. a) State the PDE representing neat flow in one-dimensional problem (i.e. parabolic equation). Using finite difference approximation derive Crank-Nicholson formula for solving the PDE. **8**

b) Solve the PDE $\frac{\partial^2 y}{\partial x^2} = \frac{\partial u}{\partial t}$ with the boundary conditions.

At t = 0, $u = \sin(\pi x)$, $0 < x < 1$

At x = 0, x = 1, u = 0, for all t

Take $\Delta x = 0.2$, $\Delta t = 0.002$ and find the values of u for t = 0 to 0.006 and x = 0 to 1. **8**

11. a) Using Lagrange interpolating polynomial of first and second order evaluate y(2) based on the following data :

x	1	4	6
y	0	1.3862	1.7917

6

b) Write short notes on the following :

i) Random search optimization

ii) Grid search optimization. **12**

OR

12. a) Using Lagrange polynomial, find unique polynomial P(x) of degree 2 if P(1) = 1, P(2) = 27, P(4) = 64. Hence evaluate P(1.5). **6**

b) Write short notes on the following :

i) Nature of optimization problem.

ii) Quasi – Newton method of optimization. **12**

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Seat No.	

T.E. (Chemical) (Semester – I) Examination, 2014
CHEMICAL PROCESS TECHNOLOGY
(2008 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) Describe production of metallic aluminium. **8**
   b) Discuss about the recovery of various salts from sea water. **10**

OR

2. a) Compare unit operations and unit processes with examples. Draw any 4 schematic representation of unit operations. **10**
   b) Discuss production of sodium carbonate. **8**
3. a) Describe production of ammonia. **8**
   b) Discuss manufacturing process of single super-phosphate. **8**

OR

4. a) Explain production of urea. **8**
   b) Describe production of sulphuric acid with its engineering problems. **8**
5. a) Draw a neat process flow diagram and explain ethyl alcohol production. **8**
   b) Discuss recovery of starch derivatives. **8**

OR

6. a) Discuss sugar production with detailed process flow diagram. **8**
   b) Explain Kraft pulp process. **8**

SECTION – II

7. a) Explain vegetable oil recovery by mechanical extraction method. **8**
   b) Compare types of coal carbonization. **8**

OR

8. a) Describe production of penicillin. **8**
   b) Explain production of detergents. **8**

P.T.O.

9. a) Explain production and applications of water gas. **8**
   b) Give details of thermal and catalytic pyrolysis. **8**

OR

10. Explain **(any 4)**. **16**
    1) Catalytic cracking
    2) Pyrolysis
    3) Polymerization
    4) Alkylation
    5) Hydrogenation.

11. Draw a neat flow diagram and explain in brief **(any 3)**. **18**
    1) Production of vinylchloride
    2) Production of Phenol
    3) Production of acetone
    4) Production of IPA.

OR

12. a) Describe production of styrene with its engineering problems. **12**
    b) Explain production of methanol in brief with a neat process flow diagram. **6**

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Seat No.	

T.E. (Chemical Engineering) (Semester – I) Examination, 2014
INDUSTRIAL ORGANIZATION AND MANAGEMENT
(2008 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.*

SECTION – I

1. Explain the following : **16**
   i) Division of labour
   ii) Remuneration
   iii) Discipline
   iv) Centralization.

   OR

   a) Define Management. Explain in details various functions of Management. **10**
   b) Planning is looking ahead and control is looking back. Comment. **6**

2. a) Explain the functions of Trade Unions. **8**
   b) What is Performance Appraisal ? Explain the importance and need of performance appraisal. **8**

   OR

   a) What is man power planning ? What are the objectives and techniques of manpower planning ? **8**
   b) Define job evaluation and explain any one methods of job evaluation. **8**

3. Write short notes on the following : **18**
   i) Vendor Development.
   ii) Inventory Control.
   iii) Inspection and Quality Control.

   OR

   i) Purchase process.
   ii) EOQ.
   iii) Functions of Store Keeper. **18**

P.T.O.

SECTION – II

4. a) Explain the following in brief : **8**
   1) Distribution channels.
   2) Distinguish between marketing and selling.

   b) State and explain objectives and importance of advertising. **8**

OR

What is Market Research ? Explain various methods of market research. How it helps an enterprise to position its business in a competitive business environment ? Explain. **16**

5. a) Distinguish between Product Patent and Process Patent. How patent rights are different from copyright ? Explain. **8**

   b) Explain the concept of TQM. **8**

OR

   a) What is International Trade ? How it helps in developing and supporting Indian Economy ? Explain in brief. **8**

   b) What is anti dumping duty ? Explain the impact of anti dumping duty in international business. **8**

6. a) Explain the concept of Guarantee and Warranty. **8**

   b) What is work measurement ? Explain the need and advantages of work measurement. **10**

OR

Write short notes on : **18**

i) FERA and FEMA

ii) Law of contract

iii) Therbligs.

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Seat No.	

T.E. (Petrochemical) (Semester – I) Examination, 2014
NUMERICAL AND STATISTICAL METHODS
(2008 Course)

Time : 3 Hours Max. Marks : 100

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

*2) Answers to the **2** Sections should be written in **separate** books.*

*3) **Neat** diagrams must be drawn **wherever** necessary.*

*4) Figures to the **right** indicate **full** marks.*

*5) **Use** of electronic pocket calculator is **allowed**.*

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

SECTION – I

1. a) Find all basic solutions to the system of equations : **6**

$x_1 + x_2 + 2x_3 = 4$

$2x_1 - x_2 + x_3 = 2$

b) Use Simplex Method to solve following Linear programming problem : **10**

Maximize $z = 4x_1 + 10x_2$

Subject to the constraints :

$2x_1 + x_2 \leq 50$

$2x_1 + 5x_2 \leq 100$

$2x_1 + 3x_2 \leq 90$

$x_1, x_2 \geq 0$

OR

2. a) Apply the principle of duality to solve following Linear programming problem : **10**

Minimize $z = 2x_1 + 2x_2$

Subject to the constraints :

$2x_1 + 4x_2 \geq 1$

$x_1 + 2x_2 \geq 1$

$2x_1 + x_2 \geq 1$

$x_1, x_2 \geq 0$

P.T.O

b) Write the dual of the following problem : **6**

Maximize $z = x_1 - x_2 + 3x_3$

Subject to constraints :

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

$$2x_1 - x_3 \leq 2$$

$$2x_1 - 2x_2 + 3x_3 \leq 6$$

$$x_1, x_2, x_3 \geq 0$$

3. a) A company has four warehouses a, b, c, d and three plants A, B, C. The requirement at warehouses a, b, c, d are 15, 16, 12, 13 units respectively. The availability at plants A, B, C are 18, 20, 18 units respectively. The unit cost of transportation is given below solve the problem for minimum transportation cost. **10**

	a	b	c	d
A	8	9	6	3
B	6	11	5	10
C	3	8	7	9

b) Solve the following assignment problem for minimum time assignment. The estimated time that each machine requires is given below : **6**

	I	II	III	IV	V
1	11	17	8	16	20
2	9	7	12	6	15
3	13	16	15	12	16
4	21	24	17	28	26
5	14	10	12	11	15

OR

4. a) A steel company has three open furnaces and five rolling mills. Transportation cost (rupees per quintal) for shipping steel from furnaces to rolling mills are shown in the following table : **10**

Mills

	M_1	M_2	M_3	M_4	M_5	**Availability**
F_1	4	2	3	2	6	8
F_2	5	4	5	2	1	12
F_3	6	5	4	7	7	14
Demand	4	4	6	8	8	

b) Solve the following assignment problem for minimum cost : **6**

	I	**II**	**III**	**IV**	**V**
A	6	5	8	11	16
B	1	13	16	1	10
C	16	11	8	8	8
D	9	14	12	10	16
E	10	13	11	8	16

5. a) Obtain correlation coefficient between population density (per square miles) and death rate (per thousand persons) from data related to 5 cities. **7**

Population Density	200	500	400	700	300
Death Rate	12	18	16	21	10

b) If the probability of a bad reaction from a certain injection is 0.001, determine the chance that out of 2000 individuals more than two will get a bad reaction. **5**

c) The probability that a note book manufactured by a company will be defective is $\frac{1}{10}$.

If 12 such note books are manufactured, find the probability that

i) Exactly two will be defective

ii) Atleast two will be defective **6**

OR

6. a) Obtain lines of regression for the following data : **7**

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

Estimate the values of

i) y when x = 2

ii) x when y = 3

b) In a test on 2000 electrical bulbs, it was found that the life of a particular make was normally distributed with an average life of 2040 hrs. and standard deviation of 60 hrs. Estimate the number of bulbs likely to burn for more than 2150 hrs. **5**

Given z = 1.83, area = 0. 4664

c) The demand for a particular spare part in a factory was found to vary from day to day. In a sample study the following information was obtained. **6**

Days	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
No. of parts demanded	1124	1125	1110	1120	1126	1115

Test the hypothesis that the number of parts demanded does not depend on the day of the week.

Given $\chi^2_{5:0.05} = 11.07$

SECTION – II

7. a) With usual notations prove the following :

i) $\mu\delta = \frac{1}{2}(\Delta + \nabla)$

ii) $hD = \log(1 + \Delta)$

iii) $\mu^2 = 1 + \frac{\delta^2}{4}$. **9**

b) Find the first and second derivatives of the function tabulated below at point x = 1.5 **8**

x	1.5	2.0	2.5	3.0	3.5	4.0
f(x)	3.375	7.0	13.625	24.0	38.875	59.0

OR

8. a) Using Lagrange's formula, find the form of the f(x) given that **8**

x	0	2	3	6
f(x)	659	705	729	804

Also find f(5).

b) The speed, v metres per second, of a car, t seconds after it starts, is shown below.

Using Simpson $\frac{1}{3}$ rule, find the distance travelled by the car in 2 minutes. **9**

y	0	12	24	36	48	60	72	84	96	108	120
v	0	3.60	10.08	18.90	21.60	18.54	10.26	5.40	4.50	5.40	9.00

9. a) Find by iteration method, a real root of $2x - \log_{10}x = 7$. **8**

b) Using Gauss – Seidel iteration method solve the system of equations **9**

$10x - 2y - z - w = 3$

$-2x + 10y - z - w = 15$

$-x - y + 10z - 2w = 27$

$-x - y - 2z + 10w = -9$

OR

10. a) Solve the following system of Linear equations by Gauss elimination method. **9**

$x_1 - x_2 - x_3 - x_4 = 2$

$2x_1 + 4x_2 - 3x_3 = 6$

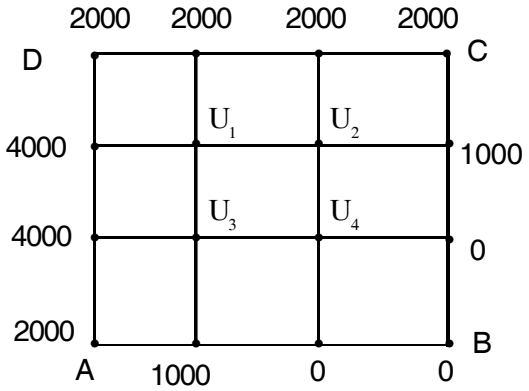
$3x_2 - 4x_3 - 2x_4 = -1$

$-2x_1 + 4x_3 + 3x_4 = -3$

b) Find an approximate value, correct to three places of decimals of the real root which lies between – 2 and – 3 of the equation $x^3 - 3x + 4 = 0$, using method of false position, three times in succession. **8**

11. a) Solve the following by Euler's modified method $\frac{dy}{dx}$ = log (x + y), y(0) = 2. Find y at x = 1.2 and 1.4 with h = 0.2. **8**

b) Solve $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$ for the following square mesh with boundary conditions as exhibited in the figure below : **8**



OR

12. a) Using fourth order Runge – Kutta method, evaluate the value of y when x = 1.1, given that

$\frac{dy}{dx} + \frac{y}{x} = \frac{1}{x^2}$, y (1) = 1 **8**

b) Solve $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = -20 (x^2 + y^2 + 2)$ over the square with sides x = 0, y = 0, x = 3, y = 3 on the boundaries with mesh length on both sides as 1 and with u = 0 on all boundaries. **8**

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Seat No.	

T.E. (Petrochemical) (Semester – I) Examination, 2014
(2008 Course)
MASS TRANSFER – I

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 answerbooks.*
*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. Answer the following questions in brief **16**
   i) Describe in brief how diffusivity is measured.
   ii) Describe eddy diffusion by giving suitable examples.
   iii) Explain Fick's first and second laws.

2. In absorption of component A from flue gas into an aqueous solvent, at a particular point in the column, the partial pressure of A on gas side is P_{AG} = 0.05 atm and concentration of A on liquid side is C_{AL} = 0.04 mol/m^3. The Henry's constant for A in the solvent is 20 atm. cm^3/mol. The overall gas side mass transfer coefficient is given as 8×10^{-6} gmol/cm^2. sec. atm. It is also given that 30% of the total resistance to mass transfer lies in the liquid film. **18**

   Determine :
   i) Feasibility of absorption
   ii) Liquid side mass transfer coefficient
   iii) Concentration on the liquid side of the interface
   iv) Partial pressure on the gas side of the interface
   v) Molar flux of A across the interface.

3. In a catalytic reaction, gaseous A is diffusing across a film at catalyst surface where it reacts instantaneously and irreversibly as follows

   $2A \rightarrow B$

   B is obtained in gaseous state only. Reaction rate at the catalyst surface is solely decided by mass transfer of A to the surface. Calculate local reaction rate in Kmol A per hr per m^2 surface area of the catalyst.

   Data : No inerts on gas side. Equimolar Composition of A and B in gas phase. Pressure and temperature : 500 KPa and 100 C respectively. Assume film thickness to be 1×10^{-4} m and diffusivity of A through the film to be 1×10^{-9} m^2/s. **16**

P.T.O.

4. a) Discuss graphical method for solving mass transfer problems involving cascaded stages of contact between two phases. **16**

   b) Discuss what you mean by volumetric mass transfer coefficient and state its role in process design.

SECTION – II

5. A stream of air with a bulk velocity of 10 m/sec at 110 kPa pressure and 320 K is flowing on the top surface of a thin flat sheet of solid naphthalene of length 0.15 m and width of 0.02 m. Calculate :

   i) The mass transfer coefficient

   ii) The rate of loss of naphthalene from the surface.

   Data :

   Kinematic viscosity of air = 1.7×10^{-5} m^2/s

   Mass diffusivity of naphthalene vapour in air = 5×10^{-6} m^2/sec.

   Vapor pressure of naphthalene at 320 K = 0.12 mm Hg. **16**

6. A batch of solids is to be dried from 45% to 1% moisture content on wet basis. The initial weight of the wet solids is 310 Kg and the drying surface is reported to be 0.35 m^2 per 50 kg of dry weight. The critical moisture content is 25% wet basis and constant drying rate is 0.37 kg/hr.m^2. For the falling rate period data available are given in the table below.

x	25	22	19	16	13.6	11	8.2	7.25	6.4
N	0.3	0.27	0.24	0.21	0.18	0.15	0.07	0.044	0.025

   x is % moisture content on dry basis and N is drying rate in Kg/m^2hr. Report if the specification can be met. If yes, calculate the batch time required for given drying duty. If no, carry out the calculation for the suitably modified specification. **16**

7. Answer the following by using humidity chart for air-water system with reference to the air having dry bulb temperature of 75° C and wet bulb temperature of 30 C.

   i) Report percent humidity and relative humidity.

   ii) Report dew point temperature and enthalpy in KJ/Kg of dry air.

   iii) Calculate heat to be added per kg of dry air under 1 atm pressure so as to decrease the relative humidity by 10%. **18**

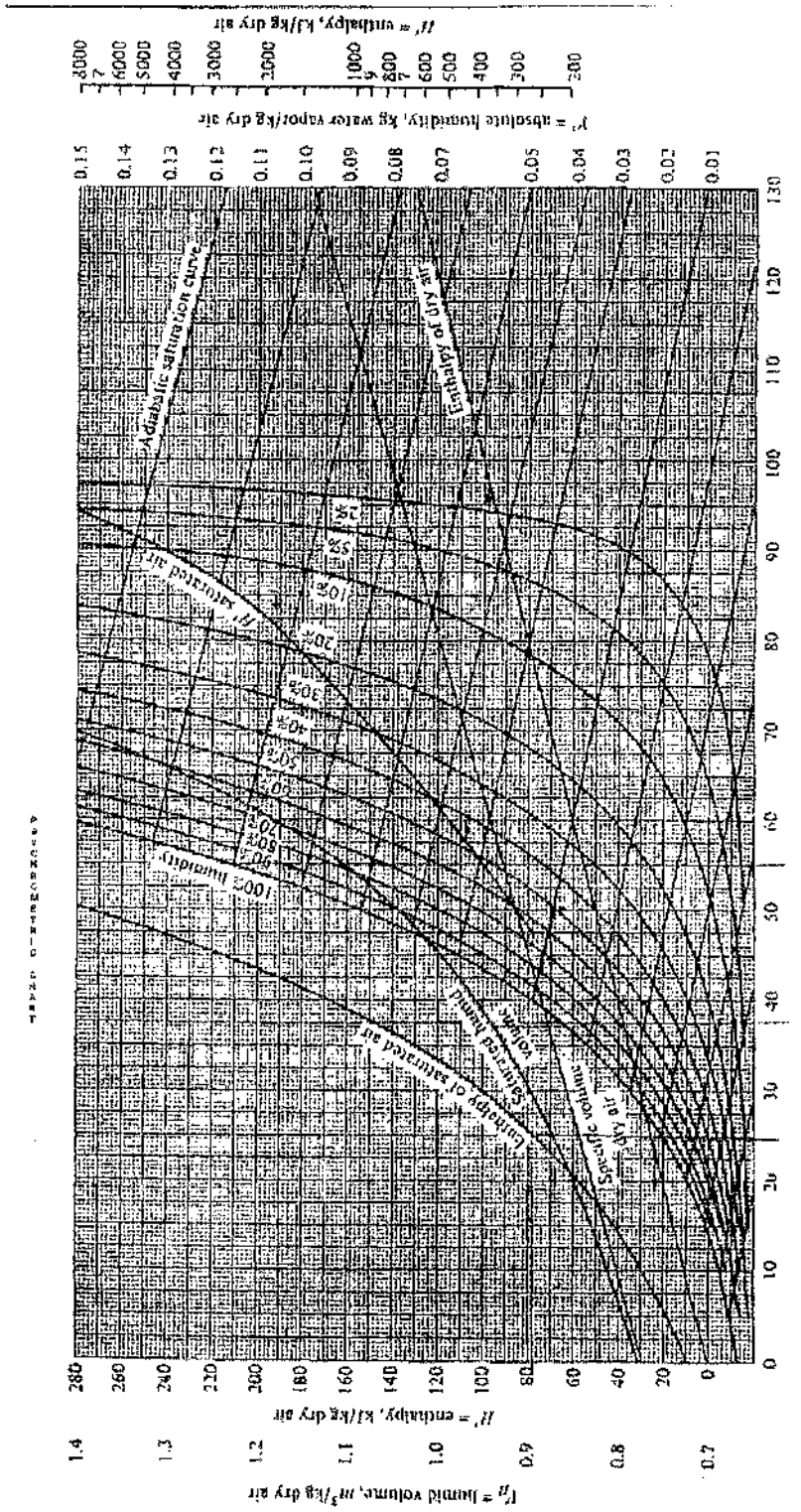
8. Write notes : **16**

   i) Humidification tower

   ii) Rotary dryer

   iii) Gas dispersion into liquid

   iv) Sherwood number.


H' = enthalpy, kJ/kg dry air
I'H = humid volume, m³/kg dry air
x' = absolute humidity, kg water vapor/kg dry air
H' = enthalpy, kJ/kg dry air
Adiabatic saturation curve
H' saturated air
Enthalpy of dry air
Enthalpy of saturated air
Humid volume
Specific dry air volume
100% humidity
90%
80%
70%
60%
50%
40%
30%
20%
10%

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Seat No.	

T.E. (Mech. & Automobile) (Semester – I) Examination, 2014
THEORY OF MACHINES – II
(2008 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) Figures to the **right** indicate **full** marks.*
*4) Assume **suitable** data **if necessary**.*

SECTION – I

1. a) Derive an expression for frictional torque in conical pivot bearing using uniform wear theory. **6**
   b) What is friction circle ? **2**
   c) A single plate clutch transmits 25 KW at 900 rpm. The maximum pr. intensity is 85 kN/m^2. The outer dia. of plate is 360 mm with both sides effective. Find the inner dia. of plate if $\mu = 0.25$. **8**

OR

2. a) Write short note on internal expanding shoe brake. Discuss in brief about leading and trailing shoe. **8**
   b) Discuss the difference between power absorbing and transmission type dynamometers. **4**
   c) A torsion dynamometer is fitted on turbine shaft to measure the angle of twist. The shaft twist 1.6° for a length of 8 m at 600 rpm. The dia. of shaft is 250 mm. Find power transmitted by the turbine if G = 80 GPa. **4**

3. Draw a cam profile with roller follower of 7.5 mm diameter. Follower is supposed to lift for 28 mm and the motion of follower should be uniform acceleration and decceleration during rise and return. Follower axis is offset by 12 mm towards right. The minimum radius of cam is 25 mm and it is rotating at 200 rpm. During first 60° of cam rotation the follower should achieve the max displacement from the zero displacement position. The follower should remain lifted for next 45° of cam rotation and should come back to its original position during next 90° of cam rotation. Find maximum velocity and uniform acceleration of follower during rise and return. **18**

OR

4. a) A cam consists of circular disc of 75 mm dia. with eccentricity of 25 mm. The follower has flat horizontal surface in contact with cam and line of action of follower is vertical passing through shaft axis. The mass of follower is 2.3 kg and pressed downwards by a spring having stiffness 3.5 N/m. In the lowest position the spring force is 45 N.
   i) Derive the expression for acceleration of follower in terms of angle of rotation from the beginning of lift.
   ii) Determine the camshaft speed where the follower begins to lift from the cam surface. **12**

   b) Prove that the speed of cam should be lessthan the limiting speed to avoid cam jump. **6**

5. a) Explain in detail the various performance curves drawn in different types of governors. Discuss the significance of each. **7**

   b) A porter governor has four arms of 250 mm long. The upper arms are attached to axis while lower are attached to sleeve at distance of 30 mm from axis. The mass of each ball is 5 kg and that of sleeve is 50 kg. The extreme radii of rotation are 150 mm and 200 mm resp. Determine the range of speed of governor. **9**

OR

6. a) What is difference between flywheel and governor ? **4**

   b) A disc of 300 mm dia. and 5 kg is mounted on one end of arm 600 mm long. The other end of arm is free to rotate in bearing. If the disc rotates about the arm with 300 rpm in clockwise direction, looking from front, with what speed will it precess about the vertical axis ? **4**

   c) Explain the gyroscopic action with the help of neat sketches in the case of
   i) Aeroplane ii) Naval ship **8**

SECTION – II

7. a) State and prove the Law of gearing. **6**

   b) Two mating gears (larger gear and pinion) have 50 and 13 involute teeth of module 10 mm and 20° pressure angle. he addendum is one module. Does interference occurs ? If it occurs, to what value should the pressure angle be changed to eliminate interference. **12**

OR

8. a) Derive an expression for the length of path of contact for two involute profile gears in mesh. **6**

   b) Two Mating involute spur gear 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 on 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
   ii) The addendum for gear wheel
   iii) The length of arc of contact
   iv) The maximum velocity of sliding during approach. **12**

   Assume pinion to be driver.

9. a) Draw a neat sketch of terminology of helical gears and define helix angle, circular pitch. **6**

   b) The approximate centre distance between two meshing spiral gears is 375 mm and gear ratio is 2. The angle between shaft is 50° and the normal circular pitch is 19 mm. If the driving and driven wheels are having same spiral angle and friction angle 6° determine :
      i) Number of teeth on each wheel
      ii) The exact centre distance
      iii) Efficiency of the drive. **10**

OR

10. a) Explain the terminology used in bevel gears with neat sketch. **6**

    b) The angle between two meshing spiral gears is 90° and centre distance is 150 mm. The normal circular pitch of the gear is 10 mm and the gear ratio is 2.5. The frictional angle is 6° and the efficiency of the drive is maximum, determine :
       i) Spiral angle of teeth
       ii) Circular pitches of the gear
       iii) Number of teeth on each wheel
       iv) The exact centre distance
       v) Efficiency of the drive. **10**

11. a) Explain with neat sketch reverted gear train. Also give its applications. **6**

    b) In a reverted epicylic gear train, the arm F carries two wheel A and D and a compound wheel B-C. The wheel A meshes with wheel B and wheel D meshes with wheel C. The number of teeth on wheel A, D and C are 80, 48 and 72 respectively. Find the speed and direction of wheel D when wheel A is fixed and arm F makes 200 rpm clockwise. **10**

OR

12. a) Explain differential gear box with neat sketch. **6**

    b) An epicyclic train is composed of a fixed annular wheel A having 150 teeth. Meshing with A is a wheel B which drives wheel D through an idle wheel C, D being concentric with A. Wheels B and C are carried on an arm which revolves clockwise at 100 rpm. about the axis of A or D. If the wheel B and D are having 25 and 40 teeth respectively, find the number of teeth of C and the speed and sense of rotation of C ? **10**

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Seat No.	

T.E. (Computer/Info. Tech.) (Semester – I) Examination, 2014
DATABASE MANAGEMENT SYSTEMS
(2008 Pattern)

Time : 3 Hours Max. Marks : 100

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

SECTION – I

1. a) State advantages of a DBMS over file-processing systems. **8**
   b) Explain Data abstraction with different levels of abstractions. **6**
   c) Explain Data Independence. **4**

OR

2. a) Explain Structure of D.B.M.S. **10**
   b) Explain following Data Models : Hierarchical, Network, ER and Object Relational Model. **8**
3. a) Explain Aggregate Functions in SQL with suitable example. **8**
   b) Explain Natural join Operation and division operation in relational algebra with example. **8**

OR

4. a) Consider the following database. **8**

   Doctor (Doctor_no, Doctor_name, Address, City).

   Hospital (Hospital_no, Name, Street, City).

   Doc_Hosp (Doctor_no, Hospital_no, Date).

   Construct the following Queries in SQL.
   1) Find out all Doctors who have visited to Hospital in same city in which they live.
   2) Find to which Hospital “Dr. Joshi” has visited.
   3) Count no. of Doctors visited to “Shree Clinic” on 1st March 2014.

   b) Explain views with suitable example. **4**
   c) Explain the need for embedded SQL. List various embedded commands. **4**

P.T.O.

5. a) What is normalization ? Explain First Normal Form and Second Normal Form with example. **8**
   b) Write short note on multivalued dependencies and 4NF. **8**

OR

6. a) What is decomposition ? Explain lossless decomposition and dependency preserving decomposition with suitable example. **8**
   b) What are the different Anomalies in databases ? **6**
   c) What is Canonical Form ? **2**

SECTION – II

7. a) What are the advantages and disadvantages of hash indices relative to B tree indices ? How the type of index influences the query processing ? **8**
   b) Explain estimation of cost of query. **4**
   c) What is role of relational algebra in query processing ? **4**

OR

8. a) What are the steps involved in query processing ? Explain each in brief with diagram. **8**
   b) What is ordered indices ? Explain the types of Ordered indices with suitable example. **8**
9. a) Write short note on : **10**
      1) The two phase locking protocol
      2) Time stamp based protocol.
   b) Explain Shadow Paging with diagram. **6**
   c) What are two types of errors that may cause a transaction to fail ? **2**

OR

10. a) Explain deadlock prevention and Recovery. **8**
    b) Explain recoverable and cascade less schedules. **8**
    c) What is extension in rigorous two phase locking protocol as compared to two phase locking protocol. **2**
11. a) Draw the diagram showing different components of Data warehouse and explain. **7**
    b) Write short note on :
       1) Persistent Programming Languages
       2) Pointer Swizzling techniques and
       3) OODBMS. **9**

OR

12. a) Explain 2 Tier and 3 Tier Architecture of databases. **8**
    b) What are different data fragmentation techniques in distributed databases ? **4**
    c) What is data mining ? What is need of data mining ? **4**

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Seat No.	

T.E. (Info. Tech.) (Semester – I) Examination, 2014
COMPUTER NETWORK TECHNOLOGY
(2008 Course)

Time : 3 Hours Max. Marks : 100

Instructions *: 1) Answers to the **two** Sections should be written in **separate** answer books.*
*2) **Neat** diagrams must be drawn **wherever** necessary.*
*3) Figures to the **right** side indicate **full** marks.*
*4) Use of calculator is **allowed**.*
*5) Assume suitable data if **necessary**.*

SECTION – I

1. a) List and explain the parameters for quality of service. How jitter and delay can affect the quality of service ? **10**
   b) Explain any two routing algorithm. **8**

OR

2. a) How packet switching makes the more use of bandwidth over circuit switching ? Explain with suitable example. Also explain what do you mean by message switching ? **10**
   b) What is count-to-infinity problem ? Explain with suitable example. **8**
3. a) Discuss the advantages and disadvantages of OSPF and BGP routing algorithm. **8**
   b) For a given class – C network, design subnets in such a way that each subnet will have at least 50 hosts. If necessary assume suitable data. Also write network and broadcast address of each subnetwork. **8**

OR

4. a) Why NAT is needed ? How does it operate ? Explain it properly with appropriate diagram. **8**
   b) Explain TCP with its header format. **8**
5. a) If the round trip time is 30 msec. and following acknowledgment come in after 26, 32 and 24 ms, respectively, what is new RTT estimate using the Jacobson algorithm ? Assume suitable value for alpha. **8**
   b) What is the purpose of ARP and RARP protocols ? What is the size of Ethernet frame carrying an ARP packet as well as RARP packet ? **8**

OR

6. a) Explain the flow control mechanism used in TCP. **8**
   b) Compare and contrast between RPC and UDP. **8**

P.T.O.

SECTION – II

7. a) What are the basic functions of E-mail systems ? Explain the importance of MIME in e-mail system. **8**

   b) Explain two look up methods used by the DNS to resolve the remote names. **8**

OR

8. a) Explain the SNMP model. What is the role of SMI in the management ? **8**

   b) List the similarities and differences between POP3 and IMAP. From ISP point of view which protocol would be better and why ? **8**

9. a) Bandwidth scaling is required for streaming stored audio/video. Which protocol is used for this purpose and why ? **8**

   b) Explain at least 2 protocols used in the real time interactive application. **8**

OR

10. a) What is RSVP ? Why it is required ? **8**

    b) What do you the integrated services ? Explain with suitable examples. **8**

11. a) Explain the basic architecture of WLAN and discuss various components in it. **9**

    b) Describe the architecture of broadband ISDN. **9**

OR

12. Write short notes on : **18**
    - Bluetooth
    - Fast ethernet
    - Frame relay.

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Seat No.	

T.E. (Information Technology) (Semester – I) Examination, 2014
OPERATING SYSTEM
(2008 Course)

Time : 3 Hours Max. Marks : 100

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

SECTION – I

1. a) Explain the operating system as a User Interface. **9**
   b) What is Virtual Machine ? Explain the Virtual Machine Architecture. **9**

OR

2. a) What is a shell in linux ? Explain following commands syntax with example in linux operating system. **9**
      i) grep
      ii) head
      iii) cut
      iv) ls.
   b) Explain any three architectures of Operating Systems. **9**
3. a) State different reasons for the process creation and what steps performed by an OS in creation of the process ? **8**
   b) What is process control block ? Explain its role. **8**

OR

4. a) Explain Unix Process State Transition diagram. **8**
   b) Consider following snapshot and apply FCFS, Pre-emptive SJF, Round Robin (Time Slice 4 Ms) to calculate avg waiting time. **8**

Process	Arrival Time	Burst Time
1	0	8
2	1	4
3	2	9
4	3	5

P.T.O.

5. a) Explain the Banker's algorithm for deadlock avoidance with example. **8**
   b) Write a semaphore solution for deadlock free dinning philosopher problem explain it in detail. **8**

OR

6. a) Explain hardware support for mutual exclusion. **8**
   b) What is binary and general semaphore ? Give definition of general semaphore and binary sempahore primitives. **8**

SECTION – II

7. a) Consider the following reference string. **9**

   7, 0, 1, 2, 0, 3, 0, 4, 2, 3, 0, 3, 2, 1, 2, 0, 1, 7, 0, 1

   Apply FIFO, LRU and optimal algorithm and calculate number of page fault occurred in each case. Number of free frames are 3.
   b) Explain the combined paging and segmentation scheme with its address translation mechanism. **9**

OR

8. a) Describe the fixed and dynamic partitioning with their strength and weakness. **6**
   b) Explain following terms : **6**
      i) Internal fragmentation
      ii) External fragmentation
      iii) Compaction.
   c) What is Belady's anomaly ? Explain it with suitable example. **6**
9. a) What are the different buffering ways in I/O buffering ? **8**
   b) What are different disk performance parameters ? Explain each in detail. **8**

OR

10. a) Explain different operations of files. **6**
    b) Explain the file sharing with its access rights. How file is accessed simultaneously ? **10**
11. a) Explain how the access matrix can be implemented effectively. **8**
    b) What is the difference between a threat and an attack ? Explain with example. **8**

OR

12. a) Explain Unix Password Scheme in detail. **8**
    b) Explain techniques and security policies to improve the resistance to threats. **8**

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[4658] – 2

Seat No.	

T.E. (Civil) (Semester – I) Examination, 2014
ADVANCED SURVEYING
(2008 Course)

Time : 3 Hours | Max. Marks : 100

SECTION – I

1. a) Explain the precision in Triangulation for Ist order, IInd order and IIIrd order in tabular form. **6**
   b) Define Geodetic Surveying. What factors are to be considered while selecting a best triangulation figure or system ? **6**
   c) Explain with neat sketches, commonly used layouts of triangulation systems. **6**

   OR

2. a) Two stations A and B are 100 km apart. The elevation of A is 185 m and that of B is 885 m. In the line of sight between A and B, there are two intervening high points C and D. C is 42 km from A and D is 81 km from A. The elevations of peaks C and D are 318 m and 750 m. Check whether the line of sight from A to B clears the peaks with a minimum clearance of 3 m above ground level. Determine the height of the signal at B for intervisibility. **10**
   b) State any four advantages of space based positioning systems. **4**
   c) Differentiate between Absolute positioning and relative positioning. **4**

3. a) Explain the following terms : **4**
      i) True value
      ii) True error
      iii) Most probable value
      iv) Residual error.
   b) Explain stepwise procedure of computation of sides of a Spherical Triangle by Spherical Trigonometry. **6**
   c) Four angles are measured at a station closing the horizon. The values of the angles are : **6**

      A = 102°48'51" weight 3

      B = 85°42'37" weight 2

      C = 108°36'47" weight 4

      D = 62°51'50" weight 1

      Give the corrected values of the angles. (use Normal equation)

   OR

4. a) What do you mean by weight of an observation ? State the rules of assigning weight to the field observations. **4**
   b) Explain clearly what is meant by side equation. How would you adjust a geodetic quadrilateral (without central station). **6**

P.T.O.

c) A surveyor carried out leveling operations of a closed circuit ABCDA starting from A and found that : **6**

B was 6.71 m above A

C was 5.59 m above B

D was 3.48 m above C

D was 13.72 m above A

The accuracy of all the four leveling operations is to be assumed as equal. Determine the probable heights of B, C, D above A by method of correlates.

5. a) Derive the expression for the difference of level between two points A and B a distance D apart, with the vertical angle as the angle of elevation from A to B. The height of the, instrument at A and that of the signal at B are equal. **10**

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

OR

6. a) Following reciprocal observations were made from two points P and Q : **10**

Horizontal distance between P and Q	= 16440 m
Angle of depression to Q at P	= 0° 3' 42"
Angle of depression to P at Q	= 0° 2' 4"
Height of signal at P and Q	= 5.53 m
Height of instrument at P and Q	= 1.42 m
R.L. of P	= 346.39 m
Rsin 1"	= 30.88 m

Calculate R.L. of Q and average coefficient of refraction at the time of observation.

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

SECTION – II

7. a) An area 8 Km wide and 16 Km long is to be surveyed using aerial photogrammetry. The aircraft has a speed of 190 Km/h. A camera with a focal length of 20 cm is to be used. The approximate scale is 1 : 10,000 and the average elevation of the ground is 360 m. The photograph size is 20 cm × 20 cm. The forward lap is 60%. **8**

i) Flying height,
ii) No. of photographs
iii) Spacing of flight lines,
iv) Exposure interval.

b) Define relief displacement. Derive an expression for displacement due to ground relief. **6**

c) Write a short note on stereo viewing techniques in digital photogrammetry. **4**

OR

8. a) Define the following terms :

i) Principal point
ii) Scale
iii) Air base
iv) Digital elevation model. **8**

b) A photo-graphic survey is carried out to a scale of 1 : 20,000. A camera with a wide angle lens of f = 170 mm was used with 25 cm × 25 cm plate size for a net 65% overlap along the line of flight. Find the error in height given by an error of 0.15 mm in measuring the parallax of the point. **6**

c) Write a short note on flight planning. **4**

9. a) Explain the advantages and disadvantages of the raster and vector data models. **6**

b) Explain with sketches the terms spectral signature and atmospheric window. **6**

c) Define remote sensing and enlist the advantages and limitations of remote sensing. **4**

OR

10. a) Write a note on applications of remote sensing. **6**

b) What are the methods to convert a paper map to a digital dataset ? What are the advantages and limitations of each method ? **6**

c) What are the components of a GIS ? **4**

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

b) What is meant by sounding ? Discuss various methods of taking soundings. **8**

OR

12. a) What do you understand by hydro-graphic surveying ? What are the various oper ations conducted in hydro-graphic surveying ? What are the applications of hydro-graphic surveying ? **8**

b) Write a short note on : **8**

i) Different types of tidal gauges

ii) Determination of MSL.

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Seat No.	

T.E. (Automobile Engineering) (Semester – I) Examination, 2014
MACHINE DESIGN
(2008 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

Unit – I

1. The layout of a shaft is as shown in fig. 1. Pulley D (diameter 480 mm) drives the shaft, while pulley C (diameter 150 mm) transmits power to a compressor. The belt tensions for pulley C are 1500 N and 600 N. The ratio of belt tensions for pulley D is 3.5. Find the shaft diameter as per A.S.M.E. code. Yield strength and ultimate tensile strength for shaft material are 380 MPa and 720 MPa respectively. Assume Kb = 1.75 and Kt = 1.25. If the solid shaft is replaced by a hollow shaft with outside diameter 30 mm, find inside diameter of the shaft. Compare the weights of the solid and hollow shaft. **18**

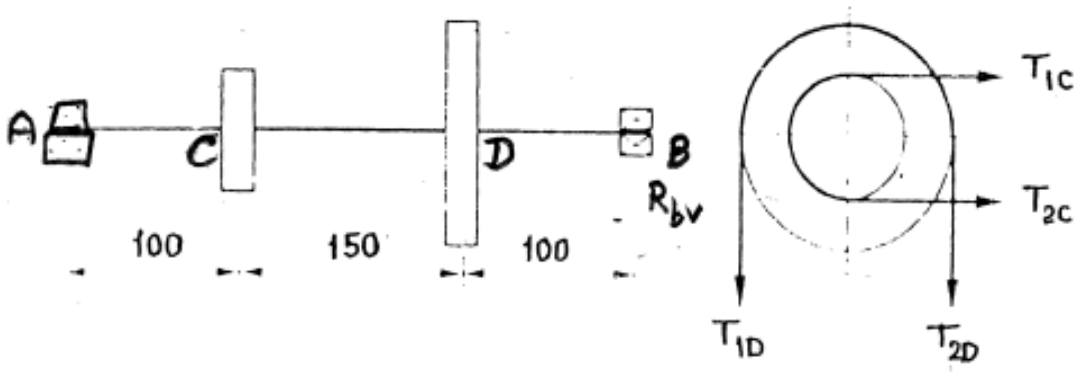

Fig. 1

OR

P.T.O.

2. a) An automobile gearbox uses a splined shaft to transmit power of 20 KW at 300 rpm. The spline used is designated as 8 × 52 × 60. The bearing pressure is limited to 6.5 MPa. Calculate the length of splines in hub, based on bearing pressure criterion. Also determine force required to shift the gear, if coefficient of friction is 0.06. **6**

   b) Design of muff coupling to connect two mild steel shafts to transmit 35 KW at 1440 rpm. The C.I. sleeve connects the shafts through two mild steel sunk keys. The maximum torque transmitted is 25% greater than the average torque.

   Material Properties : Allowable shear stress for C.I. = 15 N/mm^2

   Allowable shear stress for M.S. = 65 N/mm^2

   Allowable crushing stress for M.S. = 160 N/mm^2. **12**

Unit – II

3. a) Derive formula for torque required to raise the load and torque required to lower the load by a square threaded power screw. **6**

   b) In a machine tool application, the tool holder is pulled by means of an operating nut mounted on a screw. The tool holder travels at a speed of 6 m/min. The screw has single start square threads of 48 mm nominal diameter and 8 mm pitch. The operating nut exerts a force of 600 N to drive the tool holder. The mean radius of friction collar is 40 mm. The coefficient of friction for thread and collar surfaces is 0.2. Calculate : i) Power required to drive the screw. ii) Efficiency of the mechanism. **10**

OR

4. a) With the help of neat sketch, describe the welds subjected to bending moment. **4**

   b) A bracket is subjected to a force of 40 kN, as shown in Fig. 2. If the permissible tensile strength and the permissible shear strength for the bolts are 50 MPa and 30 MPa respectively. Determine the size of bolts. **12**

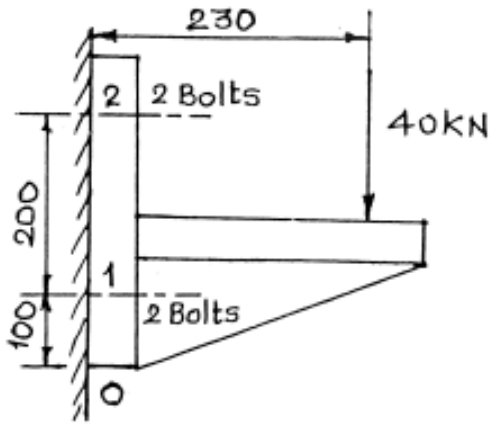

Fig. 2

UNIT – III

5. a) Explain the terms with neat sketches : **8**
   i) Soderberg diagram
   ii) Goodman diagram
   iii) Modified Goodman diagram.

   b) A cantilever beam made of cold drawn carbon steel of circular crosssection as shown in fig. 3. is subjected to a load which varies from – F to 3F. Determine the maximum load that this member can withstand for an in definite life using a factor of safety as 2. The theoretical stress concentration factor is 1.42 and notch sensitivity is 0.9. Assume the following valves. : **10**

   Ultimate stress = 550 MPa

   Yield stress = 320 MPa

   Endurance limit = 275 MPa

   Size factor = 0.85

   Surface finish factor = 0.89.

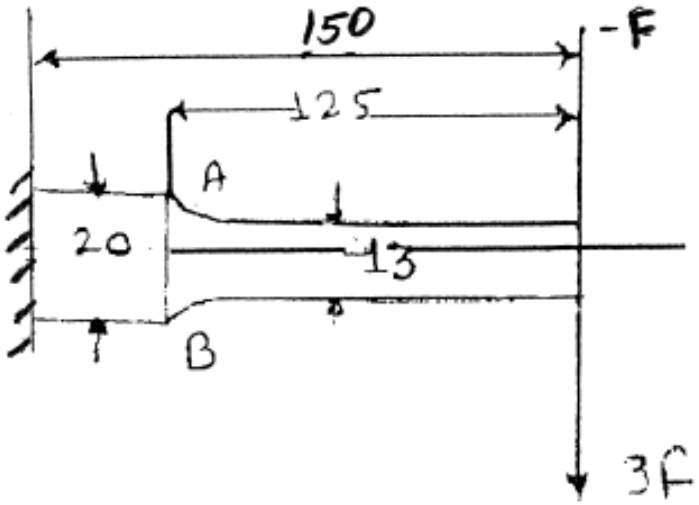

Fig. 3

OR

6. a) Explain the effect of following modifying factors on endurance strength. **8**
   i) Surface finish factor
   ii) Size factor
   iii) Reliability factor
   iv) Modifying factor to account stress concentration.

   b) A helical compression spring made of oil-hardened and tempered steel wire (Sut 1300 N/mm^2) and (G = 81500 N/mm^2) is to be used in the exhaust valve mechanism of diesel engine. The operating force on the spring varies continuously between 200 N and 500 N. The maximum valve lift is 21.5 mm. If the required f.o.s. is 1.5, determine : i) the spring diameter ii) the mean coil diameter iii) the no. of active coils. The spring index can be assumed as 8. **10**

SECTION – II

7. a) Write a note : Types of Ends for helical compression spring. **6**

   b) Design a helical compression spring for a maximum load of 1200 N, for a deflection of 25 mm. Spring index = 5. The permissible shear stress for spring material is 400 MPa. Assume modulus of rigidity as 85 GPa. Assume squared and ground ends and clearance of 1 mm between adjacent coils. **10**

OR

8. a) Derive formula for stiffness of helical torsion spring. **4**

   b) A safety valve, 50 mm in diameter is to blow off at a pressure of 1.5 MPa. It is held on it's seat by means of a helical compression spring, having initial compression of 25 mm. The maximum valve lift is 10 mm. Spring index = 6. Spring material has ultimate tensile strength of 1500 N/mm^2, modulus of rigidity 81370 N/mm^2. Take permissible shear stress to be 30% of ultimate tensile strength. Design the spring. Assume squared and ground ends. Assume clearance to be 15% of maximum deflection. **12**

9. a) Explain the development of thin film lubrication and transition to thick film lubrication with the help of $\mu N/p$ curve. **6**

   b) Following data refers to a short hydrodynamic journal bearing,

   Radial Load = 1000 N

   Journal speed = 2100 r.p.m.

   L/d ratio = 0.5

   Eccentricity ratio = 0.65

   Radial clearance = 0.002 × (journal radius)

   Flow rate of lubricant = 3.45 lit. per hour

   Calculate :

   i) Diameter of journal
   ii) Radial clearance
   iii) Bearing dimensions
   iv) Minimum oil film thickness
   v) Absolute viscosity of lubricant. **10**

OR

10. a) Define 'Basic Static Capacity' for a deep groove ball bearing. Derive Stribeck's equation for basic static capacity. **6**

    b) A 22 KW, 1440 r.p.m. electric motor is coupled to a shaft of 25 mm diameter, which is supported by two bearings, at the ends. The shaft transmits power to other shaft through a flat pulley of 300 mm diameter, placed midway between the two bearings. The coefficient of friction between belt and pulley is 0.3, while the angle of lap is 180°. The belt is horizontal. The load factor is 1.5. The expected life of bearing is 50,000 Hrs. Determine the required dynamic capacity. **10**

11. A spur gear pair is used to transmit 7.5 KW from an electric motor running at 1440 r.p.m. to a machine running at 360 r.p.m. The pinion and gear are made of plain carbon steel 55C8 (σ_{ut} =720 N/mm^2). The tooth system is 20° full depth involute. Number of teeth for pinion = 18. The service factor and load concentration factor 1.25 and 1.2 respectively. Face width is 12 times module. Gear pair is machined to accuracy of grade 7. Design the gear pair by using velocity factor and Buckingham's equation for dynamic load. Assume factor of safety as 1.2. Also suggest the required hardness for the gear pain use following data,

Velocity factor = $\left[\frac{3}{3+V}\right]$

Lewi's form factor, Y = $\left[0.484-\frac{2.87}{Z}\right]$

Load stress factor, K = $0.16\left[\frac{BHN}{100}\right]^2$

For grade 7, e = $\left[11+0.9\left(m+0.25\sqrt{d}\right)\right]$ μm

Modulus of elasticity for pinion and gear = 210 × 10^3 N/mm^2

Standard modules : 1, 1.25, 1.5, 2, 3, 4, 5, 6, 8 .... **18**

OR

12. a) Write a note : Gear lubrication. **6**

b) Following data is given for a helical gear pair, transmitting 15 KW, from an electric motor running at 720 r.p.m. to a machine running at 360 r.p.m.

Number of teeth on pinion = 18

Centre distance = 180 mm

Helix angle = 26°

Face width = 12 × (normal module)

Tooth system = 20° full depth involute

Permissible bending stress for pinion and gear = 150 N/mm^2

Service factor = 1.25

Load concentration factor = 1.1

Combined tooth error = 40 microns

Deformation factor = 11600 × (error) N/mm

Assuming Buckingham's equation for dynamic load, determine :

i) Factor of safety against bending failure

ii) Factor of safety against pitting failure

Takes Lewi's form factor, $Y' = 0.484-\frac{2.87}{Z'}$

Assume surface hardness = 350 BHN. **12**

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Seat No.	

T.E. (Production) (Semester – I) Examination, 2014
PRODUCTION MANAGEMENT
(2008 Course)

Time : 3 Hours Max. Marks : 100

Instructions : *1) Answer **any 3** questions from **each** Section.*
*2) Answers to the **two** Sections should be written in **separate** books.*
*3) **Neat** diagrams must be drawn **wherever** necessary.*
*4) Black figures to the **right** indicate **full** marks.*
*5) Your answers will be valued as a **whole**.*
*6) **Use** of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is **allowed**.*
*7) Assume suitable data, **if necessary.***

SECTION – I

Unit – I

1. a) Define clearly production of production management. Discuss scope and objectives of production management. **8**
   b) Explain different production strategies used in industries. **8**

OR

2. a) Explain production interface with other functional areas of the business. **8**
   b) Draw a functional organisational structure for a multiproduct organisation for a large scale business. Explain in brief. **8**

Unit – II

3. a) Explain an integrated approach towards PPC function. **9**
   b) Explain different stages of product life cycle. **9**

OR

4. a) Explain the relationship of product design and product cost in detail. **8**
   b) Explain with block diagram ten functions of Production Planning and Control (PPC) cycle. **10**

P.T.O.

Unit – III

5. a) What is facility location ? Explain different factors which affecting location decision. **8**
   b) Explain computerised layout planning in brief. **8**

OR

6. a) Enumerate different principles of material handling. Explain any four in brief. **8**
   b) Explain the urban and rural locations with their advantages and disadvantages. **8**

SECTION – II

Unit – IV

7. a) Why the industry has to go for sales forecasting ? Explain different forecasting techniques in brief. **9**
   b) Explain the factors which restricts the demand of products in the market, which affect the sales forecasting. **9**

OR

8. a) Explain aggregate capacity planning in brief. **9**
   b) What is manpower inventory ? Explain. **9**

Unit – V

9. a) Explain with block diagram MPS – Master Production Schedule **8**
   b) Explain the difference between PERT and CPM in detail. **8**

OR

10. a) Explain in brief priority sequencing rules. **6**
    b) Determine the sequence for the following jobs that would minimise total elapsed time for the completion of all jobs. Each of which has to go through the all three machines in order M_1, M_2 and M_3. Precessing times as given below :

Jobs	1	2	3	4	5	6	7
Machine M_1	10	11	17	16	10	18	12
Machine M_2	21	18	15	17	18	16	17
Machine M_3	18	19	21	18	22	27	18

Also draw the Gantt chart and calculate the idle time of machine M_2 and M_3 . **10**

Unit – VI

11. a) Explain the concept SCM – Supply Chain management used in production management. **8**

    b) Discuss Green Production (sustainable manufacturing) in context with

    i) Production system and life extension

    ii) Appropriate durability

    iii) Adaptability

    iv) Reliability

    v) Re-manufacturability

    vi) Reusability. **8**

OR

12. a) What do you understand by energy audit ? How this audit is organised ? How this technique can be identify the most inefficient energy consumption in manufacturing unit ? Explain this in brief. **8**

    b) Explain with block diagram manufacturing excellence and world class manufacturing concept. **8**

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[4658] – 501

Seat No.	

T.E. (Civil) (Semester – I) Examination, 2014
HYDROLOGY AND WATER RESOURCES ENGINEERING
(2012 Course)

Time : 3 Hours Max. Marks : 70

Instructions *: 1) Answer Q.* ***1*** *or Q.* ***2****, Q.* ***3*** *or Q.* ***4****, Q.* ***5*** *or Q.* ***6****, Q.* ***7*** *or Q.* ***8****, Q.* ***9*** *or Q.* ***10****, Q.* ***11*** *or Q.* ***12****.*
2) ***Neat*** *diagrams must be drawn* ***wherever*** *necessary.*
3) Figures to the ***right*** *side indicate* ***full*** *marks.*
4) Assume suitable data if ***necessary****.*
5) Use of calculator is ***allowed****.*

UNIT – I

1. Explain water budget method of estimating evaporation from lake. **6**

OR

2. Explain isohyetal method of computing mean precipitation over area. **6**

UNIT– II

3. A minor commands 420 hectares of irrigable area. It is proposed to take wheat crop on whole of the area. The kor period for the wheat is considered to be 3 weeks. The kor depth has been assessed to be 10 cm. In this period 2.75 cm of rainfall is normally expected with such an intensity that 50% of this could be taken as superfluous. Considering 10% conveyance loss find out (i) duty of the canal water at the field head, (ii) head discharge of the minor. **6**

OR

4. Define :
   i) cumec day,
   ii) hectare meter,
   iii) duty,
   iv) delta,
   v) base period,
   vi) kor depth. **6**

UNIT – III

5. The discharge from a fully penetrating well operating under steady state in a confined aquifer of 35 m thickness is 2000 lpm. Values of drawdown at two observation wells 12 and 120 m away from the well are 3.0 and 0.30 m, respectively. Determine permeability of aquifer. **8**

OR

6. Develop the equation relating the steady state discharge from a well in an unconfined aquifer and depths of water table at two known positions from the well. State clearly all the assumptions involved. **8**

P.T.O.

UNIT – IV

7. a) Explain Gumble's extreme value distribution method. **8**

   b) The ordinates of a 6-h unit hydrograph are given below : **9**

Time (h)	Ordinate of 6-h UH (m^3/s)
0	0
6	20
12	60
18	150
24	120
30	90
36	66
42	50
48	32
54	20
60	10
66	0

If two storms, each of 1 – cm rainfall excess and 6-h duration occur in succession, calculate the resulting hydrograph of flow. Assume base flow to be uniform at 10 m^3/s.

OR

8. a) State various formulae to estimate flood and explain any two methods. **8**

   b) The S-curve ordinates of intensity 1 cm/hr derived from 6-hr 1 cm unit hydrograph (UH) are given below. Derive a UH of 3-hr duration and 1 cm depth. **9**

Time (hr)	S-curve hydrograph ordinates (m^3/s)	Time (hr)	S-curve hydrograph ordinates (m^3/s)
0	0	30	82800
3	1200	33	88200
6	3000	36	91800
9	7200	39	94200
12	12600	42	95400
15	21600	45	96600
18	33600	48	97200
21	47400	51	97380
24	62400	54	97500
27	74400	57	97500

UNIT – V

9. a) A reservoir has a capacity of 50 Mm^3 and average annual inflow of 75 Mm^3. Area of the catchment is 1000 km^2. Sediment yield and the in-place specific weight of the sediments are estimated at 550 tons per km^2 and 1375 kg/m^3, respectively. Using three increments, calculate how long will it take for the reservoir to become 60% filled with sediment. The trap efficiency may be approximated by $Y = 100\left(1 - \frac{1}{65X + 1}\right)^2$ where Y is trap efficiency in per cent and X is the capacity-inflow ratio. **9**

   b) Define various levels and storages of reservoir. **4**

   c) What are the factors affecting the selection of site for reservoir ? **4**

OR

10. a) Sketch a typical flow mass curve and explain how it could be used for the determination of – i) the minimum storage needed to meet a constant demand, ii) the maximum constant maintainable demand from a given storage **9**

    b) Write a note on Benefit-Cost studies for reservoir. Explain any two methods. **8**

UNIT – VI

11. a) Describe various types of layout of subsurface drains. **6**

    b) Write a note on warabandi. **4**

    c) Explain in brief methods of application of water. **6**

OR

12. a) Describe component parts of Lift Irrigation scheme with the help of neat sketch. **8**

    b) What are co-operative water distribution society's ? State the rules and regulations laid down by these society's for equitable distribution of water to farmers. **8**

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[4658] – 512

Seat No.	

T.E. (Mechanical/Automobile) (Semester – I) Examination, 2014
METROLOGY AND QUALITY CONTROL
(2012 Course)

Time : 3 Hours Max. Marks : 70

Instructions *: 1) Answers to the Sections should be written in* ***one*** *answer books.*
2) ***Neat*** *diagrams must be drawn* ***wherever*** *necessary.*
3) Figures to the ***right*** *side indicate* ***full*** *marks.*
4) Use of calculator is ***allowed****.*
5) Assume suitable data if ***necessary****.*

1. a) Define standards. Explain "Line Standard" and "End Standard" of measurement with two examples. **6**
   b) Explain Laser Interferometer and its application. **4**

OR

2. a) Explain autocollimator with ray diagram and application. **6**
   b) Explain Hole basis system and Shaft basis system. **4**
3. a) Explain the method of measuring effective diameter using three wires with neat sketch. **8**
   b) Differentiate between Allowance and Tolerance. **2**

OR

4. a) Explain : **8**
      1) Base tangent method of gear measurement.
      2) Constant Chord method.
   b) Draw Go and NO Go plug gauge. **2**
5. a) Explain Deming's cycle and 14 points. **8**
   b) What is cost of quality ? Explain its types. **8**

OR

6. a) Explain old 7 quality tools. **8**
   b) Explain Juran's trilogy approach. **8**
7. a) Explain with OC curve followings : Producer's Risk, Consumers Risk, AOQL and LTPD. **8**
   b) The following data shows number of defectives in inspection of 10 lots of 100 sample size each for a connecting rods. Determine the control limits. And the revision made, in case the chart is 'out of limits'. **8**

Lot No	1	2	3	4	5	6	7	8	9	10
Defectives	4	5	6	7	11	1	5	9	5	4

OR

P.T.O.

8. a) Explain multiple sampling plan with flowchart. **8**

   b) Define AOQL and AOQ. For the given data calculate sample size and AOQ for single sampling plan. **8**

      1) probability of acceptance for 0.3% defectives in a lot is 0.558.
      2) lot size N = 10000 units.
      3) np' = 1.5, c = 1.
      4) Detectives found in the sample are not to be replaced.

9. a) Explain Quality Function Development and its benefits. **6**

   b) Explain JIT concept in industry. **6**

   c) Explain KAIZEN and KANBAN system. **6**

OR

10. Write short notes on (**any 3**) : **18**

    1) ISO 9000
    2) Quality audit
    3) FMECA
    4) Six sigma
    5) 5S.

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[4658] – 521

Seat No.	

T.E. (Mechanical S/W) (Semester – I) Examination, 2014
MACHINE DESIGN
(2012 Course)

Time : 4 Hours Max. Marks : 70

Instructions : *1) Answer **any five** questions.*
*2) **Neat** diagrams must be drawn **wherever** necessary.*
*3) Figure to the **right** indicates **full** marks.*
*4) **Use** of logarithmic tables and electronic pocket calculator is **allowed**.*
*5) Assume suitable data, **if necessary**.*

UNIT – 1 & 2

1. a) Two 35 mm shafts are connected by a flanged coupling. The flanges are fitted with 6 bolts on 125 mm bolt circle. The shafts transmit a torque of 800 N-m at 350 r.p.m. For the safe stresses mentioned below. Calculate : **6**
   i) Key dimensions
   ii) Thickness of Flange
   - Safe shear stress for shaft material = 63 MPa
   - Safe shear stress for bolt material = 56 MPa
   - Safe shear stress for C.I. coupling = 10 MPa
   - Safe shear stress for key material = 46 MPa.

   b) Prove that efficiency of self locking screw is less than 50%. **4**

OR

2. a) A protected type flange coupling is used to transmit 25 kW power at 500 r.p.m. from an engine to a machine. Considering an overload carrying capacity of 25%, determine following : **6**
   i) Key dimension
   ii) Bolt dimension

   Also verify designed bolt for failure stresses refer following data :
   P.C.D. of bolt = 3d. Assume the number of bolts as 6

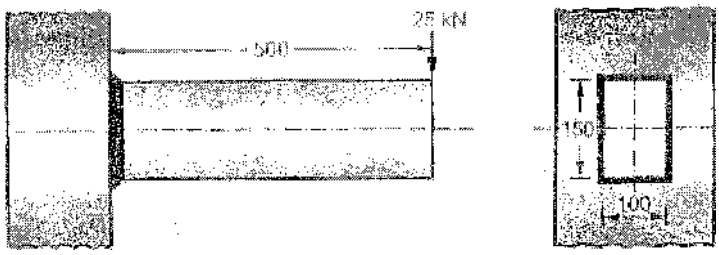
	C.I. Flange	Shaft and Key	Bolts
Allowable tensile stress (MPa)	20	60	60
Allowable shear stress (MPa)	12	35	28
Allowable compressive stress (MPa)	60	60	60

   b) Explain modified Goodman's diagram. **4**

P.T.O.

UNIT – 2 & 3

3. a) A rectangular cross-section bar is welded to a support by using a filler weld as shown in Fig. Find the size of weld if permissible shear stress in the weld material is 75 N/mm^2. **8**



b) What is self locking in case of power screw ? State its condition. **2**

OR

4. a) Two helical springs are arranged in a concentric manner, with one inside the other. Both the springs have same free length and carry a total load of 5500 N. The outer spring has 8 coils with mean coil diameter of 128 mm and wire diameter of 16 mm. The inner spring has 12 coils with mean coil diameter of 84 mm and wire diameter 12 mm. Determine,
   i) Maximum load carried by each spring.
   ii) Total deflection of each spring.
   Maximum stress in each spring. Assume G = 81 GPa. **8**

b) Compare square thread and trapezoidal thread. **2**

UNIT – 4

5. a) The following data is given for a spur gear pair made of steel. **10**
   Module = 8 mm, Centre distance = 380 mm, Permissible bending stress for pinion and for gear material = 60 N/mm^2, Pinion speed = 1500 rpm, Gear speed = 400 rpm, Face width = 10 m. 20° full depth involute system, application factor = 1.5, Factor of safety = 2.0. Assuming the velocity factor accounts for the dynamic load, calculate the rated power that the gears can transmit. Also suggest the surface hardness.

b) Explain various modes of gear tooth failure with their remedial action. **6**

OR

6. a) The following data is given for steel helical gear pair transmitting 150 kW power from a pinion shaft rotating at 1440 rpm to a gear shaft rotating at 360 rpm. **12**

- Centre distance = approximately 435 mm.
- Helix angle = 24° .
- Face width = 14 m_a.
- Number of teeth on pinion = 20.
- Permissible bending stress for pinion material = 152 N/mm^2.
- Permissible bending stress for gear material = 125 N/mm^2.
- Tooth system = 20° full depth involute.
- Service factor = 1.53.
- Combined teeth error = 0.0406 mm.
- Deformation factor = 11600 e N/mm
- Lewis form factor for pinion and gear are 0.3463 and 0.4473 resp.
- $Ft_{max} = k_a K_m F_t$

Assuming the dynamic load is accounted by the Buckingham's equation, calculate :

The factor of safety against bending failure and the surface hardness, if factor of safety against pitting failure is 1.5 $F_d = \frac{21V(bC\cos^2\psi + Ft_{max})\cos\psi}{21V + \sqrt{bC\cos^2\psi + Ft_{max}}}, N$

b) What is virtual number of teeth in case of helical gear ? **4**

UNIT – 5

7. a) Explain the selection of taper roller bearing. **4**

b) A single row deep groove ball bearing operates with the following work cycle. **12**

Element No.	Element time, %	Radial load, kN	Thrust load, kN	Radial factor, X	Thrust factor, Y	Race rotation g	Service factor	Speed, rpm
1	50	3	1	0.56	1.4	Inner	1.5	720
2	20	2.5	1	0.56	1.6	Outer	2.0	1440
3	30	No load	No load	–	–	Outer	–	720

If the expected life of the bearing is 15000 hrs with a reliability of 95%, calculate the basic dynamic load rating of the bearing so that it can be selected from the manufacturer catalogue based on 90% reliability.

If there are six such bearing in the system, what is the probability that all bearings will survive for 15000 hrs.

OR

8. a) Explain the preloading objectives in rolling contact bearing. **4**

   b) A shaft with centrally mounted helical pinion is supported by deep-groove-ball baring at both the ends. The center distance between the bearing is 100 mm. The shaft transmits 5 kW at 3000 rpm. The PCD of pinion is 80 mm. The normal pressure angle and helix angle are 20° and 19° respectively. The expected life of bearing is 8000 hrs with reliability of 95%, calculate dynamic capacity of bearing which takes up the axial thrust, so that it can be selected from the manufacturers catalogue based on reliability of 90% **12**

   Assume

   • Shock load factor = 1.25

   • Radial load factor = 0.56

   Thrust load factor = 1.2

UNIT – 6

9. a) Explain selection of roller chain from manufacturer catalogue. **6**

   b) A V-belt drive is used to transmit 30 kW power from an electric motor running at 1440 rpm to a machine running at 480 rpm. The centre distance between input and output shaft is 1000 mm. The pulley groove angle is 38° and the coefficient of friction between the belt and pulley is 0.2. The density of belt material is 1000 kg/m^3 and allowable tensile stress for the belt is 1.53 N/mm^2. The cross-sectional dimension of V-belt are

   • Width of belt at the top = 37 mm

   • Width of the belt at the bottom = 19 mm

   • Depth of the belt = 25 mm

   Find :

   i) Minimum number of belt required

   ii) The pulley diameter. **12**

OR

10. a) Explain polygon effect of chain. **6**

    b) A crossed belt arrangement is used to transmit 7.5 kW power from an electric motor rotating at 1000 rpm to a machine rotating at 500 rpm. The centre distance between two shafts is 1500 mm. The belt speed is approximately 13 m/s. The coefficient of friction between belt and pulley is 0.3. The permissible tensile stress for belt material is 1.75 N/mm^2 and the density of belt material is 0.95 gm/c.c. If the thickness of belt is 6 mm,

    Determine : **12**

    i) Diameter of pulley

    ii) Width of pulley

    iii) Length of the belt

    iv) Initial tension required in the belt.

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Seat No.	

T.E. (Electrical) (Semester – I) Examination, 2014
ELECTRICAL MACHINES – II
(2012 Course)

Time : 3 Hours Max. Marks : 70

Instructions : *1)* ***Neat*** *diagrams must be drawn* ***wherever*** *necessary.*
2) Black figures to the ***right*** *indicate* ***full*** *marks.*
3) ***Use*** *of electronic pocket calculator is* ***allowed****.*
4) Assume ***suitable*** *data,* ***if necessary****.*
5) Answer Q. No. ***1*** *or* ***2****, Q. No.* ***3*** *or* ***4****, Q. No.* ***5*** *or* ***6****, Q. No.* ***7*** *or* ***8****, Q. No.* ***9*** *or* ***10****.*

1. a) A 3 phase 4160 V, 3.5 MVA, 50 Hz star connected alternator has open circuit characteristics given by following data :

I_f (A)	50	100	150	200	250	300	350	400
V_L (V)	1620	3150	4160	4750	5130	5370	5550	5650

A field current of 200A is found necessary to circulate full load current on short circuit of alternator. Using MMF method, calculate voltage regulation at 0.8 pf lag. Negglect armature resistance. **8**

b) What is meant by short circuit Ratio in case of alternator ? **2**

OR

2. a) With neat diagram describe the slip test. How X_d and X_q can be determined ? **6**

b) Explain :
1) Coil span factor
2) Distribution factor **4**

3. a) Define voltage regulation of alternator. If the alternator is loaded using resistive load, weather its terminal voltage will increase or decrease ? Why ? **6**

b) Write a short note on 'synchroscope'. **4**

OR

4. a) A 400 V, 7.46 KW 3 phase synchronous motor has negligible armature resistance and has synchronous reactance of 10Ω/phase. Determine the minimum armature current and compounding induced emt for full load conditions. Assume efficiency at full load = 85%. **6**

b) Compare 3 phase synchronous motor with 3 phase induction motor (any 8 points). **4**

P.T.O.

5. a) Explain following speed control methods of 3 phase induction motor
   1) Cascade control method
   2) V/f control method. **8**

   b) Describe with neat diagram, construction and working of permanent magnet stepper motor. **8**

OR

6. a) Explain the operation of 3 phase induction motor as Induction Generator. State its advantages and applications. **8**

   b) Explain the construction and working of Linear Induction Motor state its applications. **8**

7. a) What are the types of compensated a.c. series motor ? Describe each with diagram. **8**

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

OR

8. a) Explain the procedure to plot circle diagram of a.c. series motor. How full load efficiency torque scale and speed scale can be determined ? **10**

   b) Explain modifications necessary in the construction of d.c. series motor to operate it satisfactorily on a.c. supply. **6**

9. a) With neat diagram explain the construction and working of 1 phase capacitor start induction motor. State its applications. **8**

   b) A 230 V, 800 W 2 pole 50 Hz 1 ph I.M. have following parameters $\rightarrow R_1 = 2.2\,\Omega$, $X_1 = 3\,\Omega$, $R_2^1 = 3.8\,\Omega$, $X_2^1 = 2.1\,\Omega$, $X_m = 86\,\Omega$.

   Calculate current, power factor and efficiency when operating at slip of 6% draw equivalent circuit and show all the terms in it. **10**

OR

10. a) With neat diagram, explain double revolving field theory. Hence draw torque-speed characteristics of single phase induction motor. **8**

    b) With neat diagram, explain construction and working of shaded pole induction motor. Draw its torque-speed characteristics. State applications of this motor. **10**

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Seat No.	

T.E. (Electronics) (Semester – I) Examination, 2014
ELECTRICAL MACHINES AND POWER DEVICES
(2012 Course)

Time : 3 Hours Max. Marks : 70

Instructions : *1) Answer Q. **1** or Q. **2**, Q. **3** or Q. **4**, Q. **5** or Q. **6**, Q. **7** or Q. **8**.*
*2) **Neat** diagrams must be drawn **wherever** necessary.*
*3) Figures to the **right** side indicate **full** marks.*
*4) Assume **suitable** data if **necessary**.*

1. a) Explain general purpose diode, fast recovery diode, schottky diode related to frequency, turn off switching time, reverse recovery time, rating and application. **6**

   b) Write short note on TRIAC driver using MOC3010 with a neat block diagram, salient features and applications. **7**

   c) Explain the use of semiconductor fuses, with the help of various curves. **7**

   OR

2. a) What are specification and rating of power diodes ? **6**

   b) Compare SCR and TRIAC. **7**

   c) What are the different cooling methods of power device ? **7**

3. a) Explain with a neat diagram the working of a single turn generator. **6**

   b) Justify the need for starter for a DC motor. Explain the working of a three point starter with the help of a neat diagram. **6**

   c) A 230 V dc shunt motor takes 32 A at full load. Find the back emf on full load if $R_a = 0.2\ \Omega$ and $R_{sh} = 115\ \Omega$ respectively. **4**

   OR

4. a) What are the different types of armature winding of a DC machine ? Explain essential difference between them in reference to merits, demerits and applications. **6**

   b) State the methods of excitation for DC machines. **6**

   c) A 6 pole wave wound dc generator, running at a speed of 300 rpm generates an induced emf of 535 V. Calculate the flux/pole, if it has 650 conductors. **4**

5. a) Explain with a diagram the difference between 3 phase slip ring induction motor and 3 phase squirrel cage induction motor. **8**

   b) Derive the condition for maximum torque in a three phase induction motor. Also obtain the expression for maximum torque. **10**

   OR

P.T.O.

6. a) Show that the rotor input, rotor copper losses, mechanical power developed is in the ratio of 1 : s : 1-s. **8**

   b) While delivering an useful power of 24 KW to the full load, a 3 phase, 50 Hz 8 pole induction motor draws a line current of 57 A. It runs at a speed of 720 rpm and is connected to 415 V supply. The p.f. of the motor is observed to be 0.707 lagging. Stator resistance per phase is 0.1Ω. Mechanical losses are 1000 Watts. Calculate, i) Shaft torque ii) Gross torque developed iii) Rotor copper losses iv) Stator copper losses v) Stator iron losses and vi) Overall efficiency (Assume star connected stator winding). **10**

7. a) Compare brushless DC motor with conventional DC motor with brushes. **8**

   b) Explain the construction and working principle of SRM. **8**

OR

8. a) Explain the working principle of permanent magnet stepper motor with constructional diagram. **8**

   b) Explain the construction and working of unipolar brushless DC motor. **8**

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Seat No.	

T.E. (E&T/C) (Semester – I) Examination, 2014
DIGITAL SIGNAL PROCESSING
(2012 Course)

Time : 150 Minutes | Max. Marks : 70

Instructions : *1) Answer Q. **1** or Q. **2**, Q. **3** or Q. **4**, Q. **5** or Q. **6**, Q. **7** or Q. **8**.*
*2) **Neat** diagrams must be drawn **wherever** necessary.*
*3) Figures to the **right** side indicate **full** marks.*
*4) Assume **suitable** data if **necessary**.*

1. a) An analog signal is given as $x(t) = \sin(10\pi t) + 2\sin(20\pi t) + 2\cos(30\pi t)$. **6**
   i) What is the Nyquist rate of this signal ?
   ii) If the signal is sampled with sampling fequency of 20 Hz, what is the discrete time signal obtained after sampling ?

   b) For a discrete time sequence x(n) = {1 2 3 4}, DFT is given by X(k) = {10 −2+2j −2 −2–2j}. Compute the DFT of x^(n) = {3 4 1 2} using circular time shift property of DFT. **6**

   c) If the impulse response of the system is : **8**
   $h(n) = [(0.5)^n + n(0.2)^n]u(n)$
   i) Compute the transfer function
   ii) Obtain the difference equation of the system.

OR

2. a) A signal $x(t) = \sin(\omega t)$ of frequency 50 Hz is sampled using a sampling frequency of 80 Hz. Obtain the recovered signal if ideal reconstruction is used. **6**

   b) State and prove Parseval's theorem for the following sequence : x(n) = {1 2 3 4}. **8**

   c) Find the Z transform of **6**

   i) $x(n) = e^{\left(-\frac{n}{40}\right)} u(n)$ Draw the pole zero diagram for X(z)

   ii) $x(n) = \left(-\frac{1}{5}\right)^n u(n) + 5\left(\frac{1}{2}\right)^{-n} u(-n-1)$

3. a) Design a digital Butterworth filter that satisfies the following constraint using Bilinear transformation. Assume T = 1 sec. **11**

$$0.9 \le \left|H(e^{j\omega})\right| \le 1 \qquad 0 \le \omega \le \frac{\pi}{2}$$

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

P.T.O.

b) Convert the analog filter with system function **6**

$$H_a(s) = \frac{s + 0.2}{(s + 0.2)^2 + 9}$$

into a digital IIR filter by means of Impulse Invariant technique. Assume T = 1 sec.

OR

4. a) Design a digital Butterworth filter that satisfies the following specification using Bilinear transformation. **11**

Sampling frequency =	8 KHz
Passband	0-500 Hz
Passband ripple	3 dB
Stopband	2-4 KHz
Stopband ripple	20 dB

b) Obtain direct form II and cascade realizations for the system : **6**

$y(n) = – 0.1y\ (n – 1) + 0.2y(n – 2) + 3x(n) + 3.6x(n – 1) + 0.6x(n – 2)$

5. a) Design a bandpass FIR filter using Hamming window for M = 11. **11**

$$H(e^{j\omega}) = 1 \qquad \frac{\pi}{4} \le \omega \le \frac{3\pi}{4}$$

$$= 0 \qquad \text{otherwise}$$

b) A signal having values in the range [– 1, + 1], is quantized using 8 bits, with MSB as sign bit **3**

i) Determine the quantization step size.

ii) Calculate the quantization noise power.

c) What is Gibb's phenomenon ? How it is reduced ? **3**

OR

6. a) Using frequency sampling method, design a FIR filter for N = 7. **9**

$$H(e^{j\omega}) = 1 \qquad 0 \le \omega \le \frac{\pi}{2}$$

$$= 0 \qquad \frac{\pi}{2} \le \omega \le \pi$$

b) Show that the symmetric FIR filter has linear phase response. **8**

7. a) Draw the block diagram of a system for sampling rate conversion by a non-integer factor and explain the operation of each block with the help of relevant diagrams and mathematical expressions. Can the positions of the decimator and interpolator be interchanged ? Justify your answer. **10**

b) Explain the factors that influence the selection of a digital signal processor. **6**

OR

8. a) Sampling rate is to be reduced from 96 KHz to 1 KHz. Highest frequency of interest is 450 Hz. $\delta_p = 0.01$, $\delta_s = 0.001$. Design a two stage decimator with decimating factors as 32 and 3. **8**

b) Write note on : **8**

i) MAC unit

ii) Pipelining.

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Seat No.	

T.E. (Instrumentation & Control) (Semester – I) Examination, 2014
INSTRUMENTAL METHODS FOR CHEMICAL ANALYSIS
(2012 Course)

Time : 3 Hours Max. Marks : 70

Instructions : *1) Answer Q.* ***1*** *or Q.* ***2****, Q.* ***3*** *or Q.* ***4****, Q.* ***5*** *or Q.* ***6****, Q.* ***7*** *or Q.* ***8****, Q.* ***9*** *or Q.* ***10****.*

2) ***Neat*** *diagrams must be drawn* ***wherever*** *necessary.*

3) Figures to the ***right*** *side indicate* ***full*** *marks.*

4) Assume suitable data if ***necessary****.*

1. a) Give detailed classification of Instrumental method of analysis. **6**

   b) Write a short notes on discharge type of atomizer. **4**

   OR

2. a) Derive Beers and Lambert Law. **6**

   b) Define Qualitative Analysis and Quantitative Analysis. **4**

3. a) Explain Ultrasonic Nebulizer with neat sketch. **6**

   b) Write a short notes on Hollow Cathode Lamp. **4**

   OR

4. a) Compare dispersive IR Spectrophotometer and FTIR Spectrophotometer. **6**

   b) Compare classical and Instrumental Method of chemical analysis. **4**

5. a) What is fluorescence ? Explain principle and working of double beam flouriometer with neat sketch. **10**

   b) Explain CO Analyser with neat sketch. **8**

   OR

6. a) What is Raman Effect ? Explain any one application of Raman Spectrometer with neat sketch. **10**

   b) Explain Chemical Shift and Spin Decoupling in NMR. **8**

P.T.O.

7. a) Explain analogy between Optical Spectroscopy and Mass spectroscopy. **8**

   b) List various chromatographic method. Explain any one with neat sketch. **8**

OR

8. a) Explain Reciprocating pump used in HPLC with neat sketch. **8**

   b) Explain ultraviolet absorption detector used in LC with neat sketch. **8**

9. a) Explain Instrumentation for 'X-ray Spectroscopy'. **8**

   b) Write a short notes on scintillation counter. **8**

OR

10. a) Enlist various radiation detector. Explain any one with neat sketch. **8**

    b) What is ESCA ? Explain auger emission spectroscopy. **8**

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[4658] – 572

Seat No.	

T.E. (Instrumentation and Control) (Semester – I) Examination, 2014
EMBEDDED SYSTEM DESIGN
(2012 Pattern)

Time : 3 Hours Max. Marks : 70

Instructions : *1) Answer **any five** questions.*
*2) **Neat** diagram must be drawn **wherever** necessary.*
*3) Figures to **right** indicate **full** marks.*
*4) Assume **suitable** data if **necessary**.*

1. a) Explain the following pins of 8051 microcontroller **4**
   i) RXD ii) TXD
   iii) $\overline{EA}$ iv) ALE
   b) Explain the PSW register of 8051 microcontroller. **3**
   c) Calculate the count to load in the timer registers to generate a delay of 500 micro seconds, if oscillator frequency is 12 MHz. **3**

OR

2. a) Explain the POWER ON RESET circuit for 8051 with suitable diagram. **7**
   b) What is the function of IT0 and IT1 bits in TCON register ? **3**
3. a) Explain the function of M1 and M0 bits in detail in TMOD register. **4**
   b) Explain with a neat diagram, interfacing of 4×4 matrix keyboard to 8051. Also draw a flowchart to explain the logic used for detection of key. **6**

OR

4. a) Explain the IE (Interrupt Enable) register in 8051 microcontroller. **4**
   b) With a neat schematic, explain the interfacing of parallel ADC to 8051 microcontroller. **6**
5. A stepper motor is to be interfaced to 8051 microncontroller.
   a) Draw a interfacing diagram for the same. **8**
   b) Write a program to drive a motor continuously, in clockwise direction for 4 rotations and anti clockwise direction 4 rotations consecutively. **8**

OR

6. a) With a neat schematic, explain the interfacing of RTC to 8051 microcontroller. **8**
   b) With a neat diagram, explain the interfacing of Serial ADC with 8051 microcontroller. **8**

P.T.O.

7. a) Draw and explain the architecture of ATmega8535 microcontroller. **10**
   b) Explain any four addressing modes with suitable instructions for AVR microcontroller. **8**

OR

8. a) Explain the function of watchdog timer of ATmega8535 controller with the help of suitable diagram. **8**
   b) Explain the following instructions of AVR microcontroller. **10**
      i) MOVW R26, R30
      ii) LPM
      iii) SUBI R15,$10
      iv) SBR R16, 5
      v) LD R15, Y+

9. a) Explain Timer 0 operation of AVR microcontroller. **8**
   b) Explain the role of UDR (USART Data Register) and the bits shown below of USART Status Register of AVR microcontroller. **8**

RXC	TXC	UDRE	FE				

OR

10. a) Explain in detail the TCCR0 of ATmega8535 microcontroller. **8**

FOC0	WGM00	COM01	COM00	WGM01	CS02	CS01	CS00

   b) Explain how the baud rate is defined with the help of UBRR (USART Baud Rate Register) in AVR microcontroller. **8**

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Seat No.	

T.E. (Chemical) (Semester – I) Examination, 2014
CHEMICAL PROCESS TECHNOLOGY
(2012 Course)

Time : 3 Hours Max. Marks : 70

***Instructions** : 1) Answer **any five** questions.*
*2) **Neat** diagrams must be drawn **wherever** necessary.*
*3) Black figures to the **right** indicate **full** marks.*
*4) Assume suitable data, if **necessary**.*

1. With the reactions for Cl_2 and NaOH production, describe the electrolytic process for chlorine and caustic soda production. **10**

OR

2. a) Describe the production of Bromine from sea water. **5**
   b) Explain the production of common salt from sea water. **5**

3. Draw and explain the production of sulfuric acid by DCDA process. Also enlist the major engineering problems involved in it. **10**

OR

4. Draw and explain the production of ethyl alcohol by fermentation of molasses. **10**

5. Explain how cleaning action taken place when soap or detergents are used and discuss the production of soap. **10**

OR

6. Explain how oil is extracted from natural raw materials with neat diagram. **10**

7. a) Write a note on refinery operations. Explain alkylation in detail. **10**
   b) Discuss the production of water gas and producer gas. **10**

OR

8. a) Draw neat flow diagram and discuss in brief : **10**
      1) Polymerization
      2) Reforming.
   b) Draw and explain the fluidized bed type catalytic cracking process. **10**

P.T.O.

9. a) Explain the production of formaldehyde from methanol with neat diagram. **10**

   b) Explain the production of vinyl chloride via ethylene dichloride. **10**

OR

10. a) Draw and explain the production of cumene via propylene alkylation of benzene. **10**

    b) Illustrate the following with neat diagram (**any one**) : **10**

       1) Production of phenol by cumene process.
       2) Production of phenol by raschig process.
       3) Production of phenol by toluene – oxidation process.
       4) Production of phenol by benzene sulfonate process.

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[4658] – 584

Seat No.	

T.E. (Chemical) (Semester – I) Examination, 2014
INDUSTRIAL ORGANISATION AND MANAGEMENT
(2012 Pattern)

Time : 3 Hours Max. Marks : 70

Instructions : *1) **Neat** diagrams must be drawn **wherever** necessary.*
*2) Black figures to the **right** indicate **full** marks.*
*3) Assume suitable data, if **necessary**.*
*4) Attempt Q. **1** or Q. **2**, Q. **3** or Q. **4**, Q. **5** or Q. **6**, Q. **7** or Q. **8**, Q. **9** or Q. **10**.*

1. a) Explain partnership with advantages and disadvantages. **6**

   b) Write a note on Merit Rating. **4**

OR

2. Explain with a neat sketch Line and Staff Organization along with advantages. **10**

3. a) Explain different types of wages. **6**

   b) Explain in detail recruitment. **4**

OR

4. Explain various functions of storekeeper. **10**

5. a) What is sales forecasting ? Explain the two types of sales forecasting in detail. **8**

   b) Explain any two Pricing Strategies in detail. **8**

OR

6. a) Explain in detail Marketing Mix. **8**

   b) Write an explanatory note Advertising. **8**

7. a) Write notes on : **8**
      i) Antidumping Duty
      ii) International Trade.

   b) Explain in detail Total Quality Management of a process industry. **8**

OR

8. a) Explain Quality Circle. **8**

   b) Explain in detail various factors affecting International Trade. **8**

P.T.O.

9. Write short notes on : **18**
   i) MRTP
   ii) FERA and FEMA
   iii) Flow Chart and Flow Diagram.

OR

10. a) Explain the term Agreement in Contract Act. Explain the various types of contract according to enforceability, formation and performance. **12**
    b) Write note on Patent and Patent Rights. **6**

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[4658] – 592

Seat No.	

T.E. (Computer Engineering) (Semester – I) Examination, 2014
DATA COMMUNICATION AND WIRELESS SENSOR NETWORKS
(2012 Course)

Time : 3 Hours Max. Marks : 70

Instructions : *1) Question **1, 2, 3, 4** (**10** marks **each**). Solve either Question **1** or Question **2** and Question **3** or Question **4**.*
*2) Question **7** and **8** (**18** marks). Solve **any one**.*
*3) Question **5, 6, 9, 10** (**16** marks **each**). Solve either Question **5** or Question **6** and Question **9** or Question **10**.*
*4) **Neat** diagrams must be drawn **wherever** necessary.*
*5) Assume **suitable** data if **necessary**.*
*6) Figures to the **right** indicate **full** marks.*

1. A) Encode the following binary data stream into unipolar, polar (RZ, NRZ), Bipolar NRZ and Manchester codes for given Data stream : 11100101. **5**
   B) A network of CSMA/CD has a bandwidth of 10 Mbps. If the maximum propagation time (including the delays in the devices and ignoring the time needed to send a jamming signal) is 25.6 μs, what is the minimum size of the frame ? **5**
2. A) What are different application of WSN ? **7**
   B) Give definitions. 1) Baud rate 2) Bit rate 3) SNR. **3**
3. A) Explain what is meant by slope overload and granular noise distortion. Also explain how adaptive delta modulation improves system tolerance to slope overload. **7**
   B) Write short note on Virtual LAN. **3**
4. A) Explain stop and wait ARQ, GO back-n ARQ and selective repeat ARQ. Comment on the performance of each. **6**
   B) Explain WSN architecture in details. **4**
5. A) Write short notes on : **10**
      1) S-MAC
      2) Sparse Topology and Energy Management (STEM).
   B) Explain in detail contention based protocols. **6**
6. A) With the help of detail flow schematic diagram explain slotted CSMA-CA protocol. **8**
   B) What do you mean by LEACH protocol ? Explain organization of LEACH protocol. **8**

P.T.O.

7. A) What are different routing challenges and design issues in WSN ? **8**
   B) Explain in detail data dissemination and gathering. **8**
   C) What is piconet ? **2**
8. A) Write short notes on : **10**
      1) Sensor Protocol for Information via Negotiations (SPIN).
      2) Geographic and energy aware routing.
   B) What are different types of routing strategies in WSN ? **8**
9. A) Explain various parameters needed for determining distances to anchor nodes. **8**
   B) Explain the impact of anchor placement. **8**
10. A) Write short note on : **8**
      1) Tiny OS
      2) Magnet OS.
   B) Explain information based sensor tracking. **8**

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Seat No.	

T.E. (Electrical) (Semester – I) Examination, 2014
ELECTRICAL MACHINES – II
(2008 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 electronic pocket calculator is **allowed**.*
*6) **Assume** suitable data, if necessary.*

SECTION – I

1. a) Explain mmf method for finding out voltage regulation of alternator. **8**

   b) A 3 phase star connected alternator, having 16 poles runs at 375 rpm. It has 144 stator slots with 10 conductors per slots. The phase value of induced emf is 1534 volts. Calculate the flux per pole. Assume full pitch winding. **6**

   c) Compare salient pole and non salient pole synchronous machines. **4**

OR

2. a) Determine voltage regulation of 2000 V, 1 – phase alternator having current of 100 A at
      i) 0.8 pf lead
      ii) 0.71 pf lag

      A full load current of 100 A is produced in short circuit test by field current of 2.5 A while an emf of 500 V is produced in open circuit test by the same field current. Take armature resistance = 0.8 Ω. **8**

   b) Define armature reaction in core of 3 ϕ alternator. Explain its effects at zero p.f. load and zero p.f. lag. **6**

   c) With usual notations derive the emf equation in case of 3 phase alternators. **4**

P.T.O.

3. a) Explain different losses occurring in 3 phase synchronous motor. Hence draw the power stage diagram of 3 phase synchronous motor. **8**

   b) With neat diagram, explain the slip test conducted on 3 phase salient pole alternator. How direct and quadrature axis reactance can be determined ? **8**

OR

4. a) A synchronous motor has a synchronous reactance of 10 Ohms per phase and negligible resistance. It takes an input current of J kW per phase when operating at 250 voltage per phase. Find its induced emf and angle of retard. Assume unity p.f. **8**

   b) Explain the need of parallel operation of alternators. Hence explain dark lamp method with neat diagram. **8**

5. a) Write a note on 3 phase induction generator. **8**

   b) Explain :

      i) v/f control method

      ii) Rotor resistance control methods in case of 3 phase induction method. **8**

OR

6. a) With neat diagram explain construction and working of 3 phase synchronous induction motor. **8**

   b) Write a short note on 3 phase induction type voltage regulator. **8**

SECTION – II

7. a) Explain the operation of d. c. series motor on a.c. supply. Explain the problems associated with AC operation. How these problems can be reduced ? **10**

   b) With neat diagram explain inductively compensated a.c. series motor. **6**

OR

8. a) Describe the procedure for drawing circle diagram of a.c. series motor. How the efficiency at full load, power factor at full load, torque scale can be determined from it ? **10**

   b) Draw and explain the approximate phasor diagram of plain a.c. series motor. **6**

9. a) With suitable diagram explain construction and working of brushless d.c. motor state its applications. **8**

   b) Write a short note on linear induction motor. **8**

OR

10. a) Explain the effects of slot harmonics on performance of the machine. Also give remedial measures for it. **8**

    b) What are harmonic synchronous torque ? What are its effects on induction motor operation ? **8**

11. a) Explain the construction and working of single phase capacitor start induction motor. State applications of this motor. **8**

    b) A 2 pole 240 V, 50 Hz single phase I. M. has following constants referred to the stator

    $R_1 = 2.2\ \Omega$, $X_1 = 3.0\ \Omega$

    $R'_2 = 3.8\ \Omega$, $X'_2 = 2.1\ \Omega$

    $X_m = 86\ \Omega$

    Calculate the stator current, input power and power factor at full load when motor is operating at 2820 rpm. **10**

OR

12. a) Explain the construction and working of shaded pole induction motor. State applications of this motor. **8**

    b) Explain in detail the tests to be conducted on 1 – phase induction motor to determine the equivalent circuit parameters. Draw the equivalent circuit for the motor showing the parameters determined under running condition neglecting corelosses. **10**

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Seat No.	

T.E. (Electrical) (Semester – I) Examination, 2014
ELECTRICAL INSTALLATION, MAINTENANCE AND TESTING
(2008 Pattern)

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 different types of ac supply systems with relevant circuit diagrams. **6**
   b) What is primary distribution system ? Explain in detail any two primary distribution systems. **10**

OR

2. a) State and explain Kelvin's law for calculation of economic cross section of conductor. State its limitations. **8**
   b) A 3 phase 4 wire distributor supplies a balanced voltage of 400/230 V to a load consisting of 80 A at p.f. 0.8 lagging, 70 A at p.f. 0.9 lagging and 50 A at unity p.f. for R, Y and B phase respectively. Calculate the voltage drop in neutral conductor and hence calculate voltage at supply end of 'R' phase considering load voltage as reference. The resistance of each phase and neutral is 0.2 ohms. **8**

3. a) Define earth resistance. State different types of electrodes used for earthling. **4**
   b) What is soil resistivity ? Explain different factors affecting soil resistivity. **6**
   c) Enlist general design consideration for distribution system design. Explain any three in detail. **8**

OR

4. a) Classify different types of substations. Define i) step potential and ii) touch potential related to sub-station with necessary circuit diagram. **8**
   b) Draw a single line diagram of 132/33 kV substation having two 132 kV incoming lines and four 33 kV out going lines. Also show all the essential equipment in the layout with their ratings. **10**

5. a) What is breakdown maintenance and condition based maintenance ? Give one example of each. **8**
   b) Explain preventive maintenance of power transformer in detail. **8**

OR

P.T.O.

6. a) State and explain different factors affecting life of insulation of equipment. **8**
   b) Define and explain importance of dielectric absorption and dielectric discharge ratio in condition monitoring of an equipment. **8**

SECTION – II

7. a) Why it is necessary to maintain purity of transformer oil ? **4**
   b) What is Partial Discharge measurement ? Why it is necessary ? **6**
   c) Explain filtration process of transformer oil in detail. **6**

OR

8. a) What is dissolved gas analysis ? Where this technique is useful ? **8**
   b) Write a short note on condition monitoring of 'transformer bushings'. **8**

9. a) Explain 'tan δ' measurement for condition monitoring of insulation. **8**
   b) Explain in detail any two cable fault location methods. **8**

OR

10. a) State various abnormal conditions and causes of faults in induction motor. **8**
    b) Explain in detail condition monitoring of power transformer. **8**

11. Explain working, troubleshooting and maintenance of any two of the following appliances : **18**
    i) Electric mixer
    ii) Refrigerator

OR

12. Explain working, troubleshooting and maintenance of any two of the following appliances : **18**
    i) Micro wave oven
    ii) Electric fan.

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Seat No.	

T.E. (Electronics) (Semester – I) Examination, 2014
DATA COMMUNICATION
(2008 Course)

Time : 3 Hours Max. Marks : 100

N.B. *: i) Answer **any 3** questions from **each** Section.*
*ii) Answers to the **two** Sections should be written in **separate** books.*
*iii) **Neat** diagrams must be drawn **whenever** necessary.*
*iv) Figures to the **right** indicate **full** marks.*
*v) Use of electronic pocket calculator and steam table is **allowed**.*
*vi) Assume suitable data, if **necessary**.*

SECTION – I

1. a) What are the conditions for a random process to be wide sense stationary ? What is ergodicity ? **4**

   b) PDF of a random variable "X" is given by $f_x(x) = e^{-x}$ from $x \geq 0$. Then find :
   1) Mean E[X].
   2) Mean Square $E[X^2]$.
   3) Variance.
   4) Standard Deviation. **8**

   c) Define auto correlation function. State and explain any three properties of auto correlation function. **4**

   OR

2. a) Show that if a wide sense stationary process X(t) is passed through a LTI filter with impulse response h(t) then its output has constant mean square value. **8**

   b) Compare Binomial, Poisson's, Gaussian's and Reighlay's probability models w.r.t. their probability distribution functions. **8**

3. a) Draw the line code formats for 11001001 :
   i) RZ unipolar
   ii) NRZ polar
   iii) AMI
   iv) Split phase manchester
   v) RZ polar.

   Also sketch the Power Spectral Density function of the above formats. **8**

   b) Explain Inter Symbol Interference (ISI) and also how the Eye pattern is used to interpreted the ISI. **8**

   OR

P.T.O.

4. a) Evaluate power spectral density of unipolar NRZ and polar RZ code. Plot the spectrum. **8**

   b) Explain the need of synchronizer in digital multiplexing. Draw and explain early-late bit synchronizer. **8**

5. a) For a systematic LBC, the three parity check digits C_4, C_5, C_6 are given by

   $C_4 = d_1 + d_2 + d_3$

   $C_5 = d_1 + d_2$

   $C_6 = d_1 + d_3$

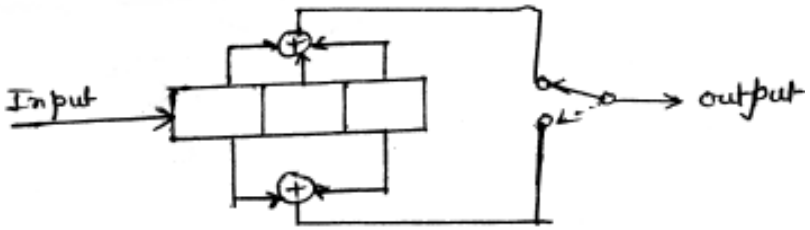
   1) Construct generator matrix.
   2) Construct code generated by this matrix.
   3) Determine error-correcting capability.
   4) Prepare a suitable decoding table.
   5) Decode the received words 101100 and 100011. **10**

   b) Explain the following terms in connection with convolution codes :

   i) Code rate and constraint length.
   ii) Steady state transitions.
   iii) Termination of Trellis diagram. **8**

OR

6. a) A convolution encoder is shown in the following figure with a rate = 1/2, K = 3.



   1) Draw the code tree, state transition and trellis diagram.
   2) If the received signal at the decoder for eight message bit is
      Y = (00 01 10 00 00 00 10 01)
      Trace the decision on trellis or code tree diagram and find out message bit sequence. **10**

   b) Explain in brief all the different types of error correcting techniques :

   1) Stop and Wait ARQ
   2) Go-Back N ARQ
   3) Selective Repeat ARQ. **8**

SECTION – II

7. a) Show that the channel capacity of an ideal AWGN channel with infinite bandwidth is given by $C_\infty = (1/\ln 2)(s/n)$. Where s is average signal power and n/2 is the power spectral density of gaussian noise. **4**

   b) If M is number of messages emitted by the source, prove that the upper bound on entropy is given by $H_{max} \leq \log_2 M$. **6**

   c) What do you mean by mutual information ? Prove that :

   i) $I(x, y) = I(y, x)$.
   ii) $I(x, y) = H(x) + H(y) - H(x, y)$. **6**

OR

8. a) An ideal communication system with an average power limitation and White Gaussian Noise has a BW of 1 MHzs and S/N of 10.
   i) Determine the channel capacity.
   ii) If S/N drops to 5, what BW is required for the same channel capacity.
   iii) If BW is decreased to 0.5 MHzs, what S/N ratio is required to maintain the channel capacity ? **6**

   b) State and prove Shannon's information capacity theorem. **6**

   c) A source emits four symbols with probabilities $P_0 = 0.4$, $P_1 = 0.3$, $P_2 = 0.2$ and $P_3 = 0.1$. Find the amount of information obtained. **4**

9. a) Derive the expression for BER of FSK. **4**

   b) Explain the phase continuity concept in MSK. **6**

   c) Compare error probabilities for ASK and BFSK. **8**

OR

10. a) Give mathematical representation of QPSK signal. Draw the signal space diagram of offset QPSK signal. Write the expression of all message points in the diagram. **8**

    b) Draw the signal space representation for orthogonal and non orthogonal BFSK signal. **6**

    c) Compare MSK and QPSK system. **4**

11. a) A binary FSK, FH – SS system has an information rate of 3 kbps and is operating in a jamming environment where entire channel is being jammed with a power level 5 times greater than the received signals. Without the jammed, the signal to noises ratio = 60 dB and $N_0 = 10$ W/Hz. If required Pe = 10 W/Hz determine minimum processing gain and corresponding transmission bandwidth (Bt). **6**

    b) Explain the working principle of CDMA with block diagram. **6**

    c) Explain the working principle of slotted ALOHA and CSMA. **4**

OR

12. a) Explain the working of DSSS transmitter and receiver with its mathematical analysis. **6**

    b) State and explain properties of PN sequence. **4**

    c) Draw and explain the block diagram of FH-SS transmitted and receiver. **6**

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Seat No.	

T.E. (E&TC) (Semester – I) Examination, 2014
DIGITAL COMMUNICATION
(2008 Course)

Time : 3 Hours Max. Marks : 100

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

SECTION – I

1. a) Identify and compare the distinctive feature and relative advantage of PCM (with and without companding), delta modulation and differential PCM. **8**

   b) We wish to transmit a 100 character alphanumeric message in 2s using 7-bit ASCII coding, followed by an eighth bit for error detection per character. A multilevel PAM waveform with M = 32 levels is used. **8**

   A) Calculate the effective transmitted bit rate and symbol rate.

   B) Repeat part (a) for 16 level PAM, 8 level PAM, 4 level PAM, PCM (Binary).

   OR

2. a) Derive an expression for signal-to-quantisation noise ratio in a Delta modulation (DM) system with no slope overload. **8**

   b) Consider an audio signal with spectral components limited to the frequency band 300 to 3300 Hz. Assume that the sampling rate of 8000 samples/s will be used to generate a PCM signal. Assume that the ratio of peak signal power to average quantization noise power at the output needs to be 30dB. **8**

   a) What is the minimum number of uniform quantization level needed and what is minimum number of bits per sample needed ?

   b) Calculate the system bandwidth (as specified by the main spectral lobe of signal) required for detection of such a PCM signal.

3. a) Explain need of Line coding. State its properties. Draw and give mathematical expression of Power Spectral density for unipolar NRZ, Polar RZ, AMI, and Manchester. **10**

   b) A computer gives a binary data at the rate of 56 kbps and its transmitted using base band PAM system that is designed to have a raised cosine spectrum. Determine transmission band width required for roll off rates i) α = 0.25 ii) α = 0.75. **8**

   OR

P.T.O.

4. a) Explain Inter Symbol Interference (ISI) with help of block diagram of a binary base band transmission system. Also explain Nyquist solution used for curing ISI. **10**

   b) Write short note on with respect to PCM **8**

   a) Decoding noise

   b) Error threshold.

5. a) Classify and explain different types of random processes. **8**

   b) Two random processes z(t) and y(t) are given by

   $z(t) = A \cos(\omega ct + \phi)$

   $y(t) = A \sin(\omega ct + \phi)$

   Where A and ωc are constants and ϕ is a uniform random variable over $(0, 2\pi)$. Find the auto correlation and cross correlation of z(t) and y(t). **8**

OR

6. a) Explain ergodic process. If $X(t) = A \cos(2\pi f_c t + \varnothing)$ is random process with $\varnothing$ as a random variable uniformly distributed over $(0, 2\pi)$. Prove that x(t) is ergodic in mean. **8**

   b) A wide sense stationary random process X(t) is applied to the input of LTI system with impulse response $h(t) = 3e - 2t\, u(t)$. Find the mean value of output Y(t) of the system if $E[X(t)] = 2$. **8**

SECTION – II

7. a) With a neat diagram, explain how a coherent binary FSK wave can be generated and detected. And compare its performance with BPSK. **10**

   b) The bit rate of NRZ data stream is 10Mbps and average energy per bit is 0.02 units. Find the Euclidean Distance 'd' and Bandwidth for the following Schemes. 1. BPSK 2. 8-PSK, 3. QPSK, 4. BFSK. **8**

OR

8. a) Compare the Euclidian distance 'd' and Bandwidth of M-Ary PSK, M-Ary FSK and QAM with M = 2n for n = 3, 4. **10**

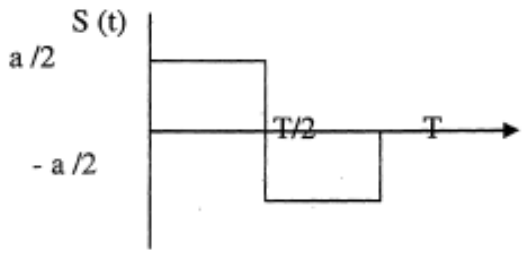
   b) The following bit streams are to be transmitted using DPSK scheme **8**

   i) 1011100011

   ii) 0101000111.

   Determine and sketch the encoded sequence and transmitted phase sequence.

9. a) Consider the signal S(t) shown in fig. **8**



   Determine the impulse response of a filter matched to this signal and sketch it as a function of time, Plot the matched filter output as a function of time.

   b) Derive the expression for the probability of error of a BFSK system. **8**

OR

10. a) Derive the expressions for signal to noise ratio and error probability of a matched filter in presence of white Gaussian noise. **8**

    b) Binary data is transmitted using M-ary PSK at a rate 2 Mbps over RF link having bandwidth 2 MHz. Find signal power required at receiver input so that bit error probability is less than or equal to 10^5. The channel noise PSD is 10^{-8} Watt/Hz. **8**

    Calculate for M = 16 and M = 32

    Given erf (0.99996) = 3.1

    erf (0.99995) = 3.2

11. a) With a neat block diagram, explain the working of a working of a frequency hopped transmitter – receiver combination. **8**

    b) A PN sequence is generated using a feedback shift register of length 4. Find the generated output sequence if the initial contents of shift register are 1000. If the chip rate is 10^7 Chip/sec calculate the chip and PN sequence duration and period of output sequence. Draw its Scheme arrangement. **8**

OR

12. a) Represent variation of the frequency of an slow hop spread spectrum system with binary FSK, having following parameters. **8**

    Number of bits per MFSK symbol K = 2.

    Number of MFSK tones $M = 2^K = 4$

    Length of PN segment per hop k = 3

    Total number of frequency hops $2^k = 8$

    for the binary message of 01111110001001111010

    Generate the PN sequence for the message to be transmitted. The period of the PN sequence is $2^4 - 1 = 15$ with initial shift register content of 1100.

    b) What is multi-user communication ? Describe different multiple access techniques on the basis of channel sharing and applications. **8**

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Seat No.	

T.E. (E&TC) (Semester – I) Examination, 2014
NETWORK SYNTHESIS AND FILTER DESIGN
(2008 Pattern)

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** diagrams must be drawn **wherever** necessary.*
*4) Assume **suitable** data if **necessary**.*

SECTION – I

1. a) Define Network synthesis. State the properties of Network functions. **4**
   b) Test whether the following polynomial is Hurwitz **6**
   $F(s) = s^4 + s^3 + 5s^2 + 3s + 4$
   c) Synthesize the following p.r. impedance function using elementary synthesis procedure. **8**

$$Z(s) = \frac{6s^3 + 3s^2 + 3s + 1}{6s^3 + 3s}$$

OR

2. a) Check whether the following are stable network functions. **4**
   i) $\frac{s}{s^2 - 3s + 4}$
   ii) $\frac{s-1}{s^2 + 4}$
   b) Which of the following are p.r.f. functions ? Give reasons. **6**
   i) $\frac{s+2}{s^2 + 3s + 2}$
   ii) $\frac{3s^2 + 5}{s(s^2 + 1)}$
   c) Synthesize the following impedances by successive removals of $j\omega$ axis poles or by removing min[Re($j\omega$)]. **8**
   i) $\frac{s^3 + 4s}{s^2 + 2}$
   ii) $\frac{s+1}{s(s+2)}$

P.T.O.

3. a) Indicate which of the following functions are either R-C, R-L, or L-C impedance functions. **6**

   i) $Z(s) = \dfrac{s^3 + 2s}{s^4 + 4s^2 + 3}$

   ii) $Z(s) = \dfrac{s^2 + 6s + 8}{s^2 + 4s + 3}$

   iii) $Z(s) = \dfrac{s^2 + 4s + 3}{s^2 + 6s + 8}$

   b) Synthesize the following function by continued fractions expansion method. **4**

   $$Z(s) = \frac{s^2 + 2s + 2}{s^2 + s + 1}$$

   c) Synthesize the following function by Partial Fraction expansion method. **6**

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

   OR

4. a) State the properties of R-C driving-point impedances and R-L driving-point impedances. **6**

   b) Synthesize the following function by continued fraction expansion method. **4**

   $$Z(s) = \frac{(s^2 + 1)(s^2 + 3)}{s(s^2 + 2)}$$

   c) Synthesize the following function by partial fraction expansion method. **6**

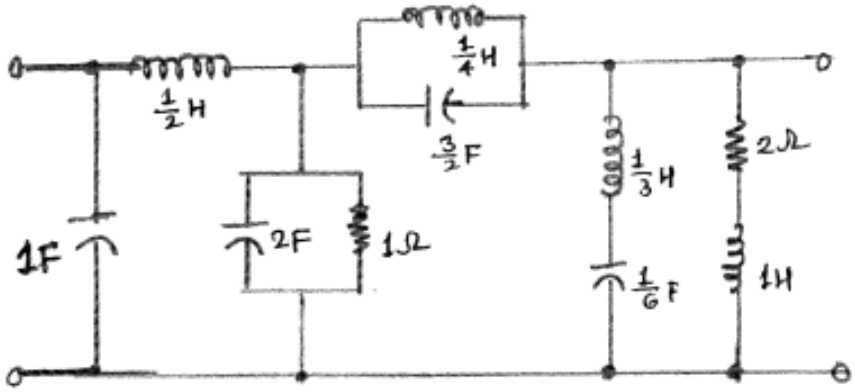
   $$Z(s) = \frac{2(s+1)(s+3)}{(s+2)(s+6)}$$

5. a) State the properties of Transfer functions. **4**

   b) Synthesize the following function with 1-Ω termination. **6**

   $$Z_{21}(s) = \frac{2}{s^3 + 3s^3 + 4s + 2}$$

   c) Identify the zeros of transmission for the given network. **6**



OR

6. a) Synthesize the following voltage ratio with 1-Ω termination using Lattice network. **4**

$$\frac{V_2}{V_9} = \frac{1}{2} \cdot \left(\frac{s-1}{s+1} \right)$$

b) Synthesize the following function with 1-Ω termination. **6**

$$Z_{21}(s) = \frac{s^3}{s^3 + 3s^2 + 4s + 2}$$

c) Synthesize the following voltage ratio with 1-Ω termination using Bridge – T network. **6**

$$\frac{V_2}{V_1} = \frac{s^2 + 1}{s^2 + 2s + 1}$$

SECTION – II

7. a) State the characteristics of Butterworth and Chebyshev approximations. **4**

b) Derive the expression for transfer function of normalized low-pass filter of second-order butterworth filter. **6**

c) Synthesize third-order low-pass Butterworth passive filter for the following specifications : $R_0 = 500\,\Omega$ and $\omega_c = 10^4$ rad/sec. **8**

OR

8. a) Explain frequency scaling and impedance scaling. **6**

b) Transform the third-order Butterworth normalized low-pass passive filter into a high-pass filter with $500\,\Omega$ impedance level with cut-off frequency $\omega_0 = 10^6$ rad/sec. **8**

c) Write a short note on Chebyshev approximations. **4**

9. a) Draw a neat diagram of positive feedback topology. And derive the transfer function of the positive feedback topology assuming an ideal op-amp. **10**

b) Write a short note on RC-CR transformation. **6**

OR

10. Synthesize a second-order Bandpass filter with a centre frequency of 1000 rad/sec and a pole Q of 10. The gain at the centre frequency is required to be 0 dB. **16**

11. a) Define sensitivity. And derive an expression for the sensitivity of ω_p and K (DC gain constant) to the component values R_1, R_2, C_1, C_2, r_1 and r_2 for given transfer function of lowpass sullen and key circuit for n = 2 (order of filter). **8**

$$T(s) = \frac{K / R_1 R_2 C_1 C_2}{s^2 + s\left(\frac{1}{R_1 C_1} + \frac{1}{R_2 C_1} + \frac{1-K}{R_2 C_2}\right) + \frac{1}{R_1 R_2 C_1 C_2}}$$

b) Write a short note on op-amp frequency characteristics and compensation techniques. **8**

OR

12. Write a short note on following : **16**
    i) FDNR
    ii) Gyrator
    iii) NIC
    iv) Multielement deviation.

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Seat No.	

T.E. (E&TC) (Semester – I) Examination, 2014
DIGITAL SIGNAL PROCESSING
(2008 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) **Assume** suitable data, **if** necessary.*

SECTION – I

1. a) Consider the analog signal. **8**

$x_a(t) = 3\cos 200\pi t$

i) Determine the minimum sampling rate required to avoid aliasing.

ii) Suppose that the signal is sampled at the rate $F_S = 400$ Hz. What is the discrete-time signal obtained after sampling ?

iii) Suppose that the signal is sampled at the rate $F_s = 150$ Hz. What is the discrete time Signal obtained after sampling ?

iv) What is the frequency $0 < F < F_S / 2$ of a sinusoid that yields samples identical to those in part (iii) ?

b) Determine the natural and the force response for the given difference equation. **10**

$y(n) - 4y(n-1) + 4y(n-2) = x(n) - x(n-1)$, for the input $x(n) = (-1)^n u(n)$

OR

2. a) Obtain the direct form – I and direct form – II structures for the following systems. **12**

i) $y(n) = 7y(n-1) + 2y(n-2) + 2x(n) + 2x(n-1) + x(n-2)$

ii) $y(n) = -0.25y(n-1) - 0.05y(n-2) + x(n) - 2x(n-2)$

iii) $y(n) = 5x(n) + 2.5x(n-1) - 2.5x(n-2) - 5y(n-3)$

b) Prove that for a stable system, **6**

$\sum_{k=-\infty}^{\infty} |h(k)| < \infty$

P.T.O.

3. a) What are the difference between linear convolution and circular convolution ? Using DFT and IDFT method, find the circular convolution of given sequence. Do not use matrix method. **8**

   $x_1(n) = \{1, 2, 0, 1\}$ and $x_2(n) = \{0, 3, 2, 1\}$

   b) The system characterized by the difference equation **8**

   $$y(n) = \frac{1}{4}x(n) + \frac{1}{2}x(n-1) + \frac{1}{4}x(n-2)$$

   Find the H(z), DTFT $H(\omega)$, and sketch Magnitude and Phase response.

   OR

4. a) Using radiax - 2 FFT DIT algorithm find X(k) for the given x(n)
   $x(n) = \{1, 2, 3, 4, 5, 6, 7, 8\}$ **10**

   b) Compare DFT with FFT. How computational complexity get reduce in FFT ? **6**

5. a) Compute the inverse Z transform for all possible ROCs, from the given Z-transform. **8**

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

   b) Explain scaling and shifting properties of ROC of Z-transforms. **4**

   c) Using differentiation property of Z-transform, find Z-transform of $x(n) = n^2 \cdot u(n)$. **4**

   OR

6. a) Compute impulse response and step response of the system whose output is given by difference equation **8**

   $y(n) = 0.7y(n-1) - 0.12y(n-2) + x(n) + x(n-1)$

   b) Compute the Z transform and ROC for

   i) $x(n) = (0.5)^n + u(n+2) + (3)^n u(-n-1)$

   ii) $x(n) = (a)^{|n|}$ **8**

SECTION – II

7. a) Design a filter of length M = 15 using frequency sampling technique for required sampled frequency response as follows : **10**

   $$|H(k)| = \begin{cases} 1 & \text{for } k = 0, 1, 2, 3 \\ 0.4 & \text{for } k = 4 \\ 0 & \text{for } k = 5, 6, 7 \end{cases}$$

b) Derive expression for relation between s and z for impulse invariance method for IIR filter design and explain mapping of s domain into z domain. **8**

OR

8. a) Convert an analog filter with system function **8**

$$H(s) = \frac{s + 0.1}{(s + 0.1)^2 + 9}$$

Into a digital IIR filter using bilinear impulse invariance method. The resultant digital filter should have a resonant frequency of $\omega_r = \pi/4$.

b) Obtain H(z) for second order LPF with using impulse invariance method. **6**

c) What is meant by frequency warping effect, how to minimize it ? **4**

9. a) Consider a multirate structure as shown in Fig. 1. b where $H_0(z)$ and $H_1(z)$ are ideal low pass and high pass filter with cutoff frequency of $\omega_c = \pi/4$ and $\omega_c = 3\pi/4$ respectively. If the input is a real signal with DTFT as shown in Fig. 1 a. Sketch the DTFT of $y_0(n)$ and $y_1(n)$. **10**

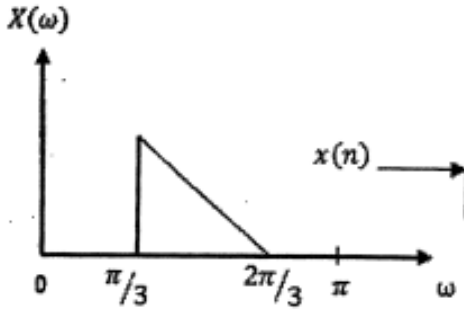

Fig. 1. a

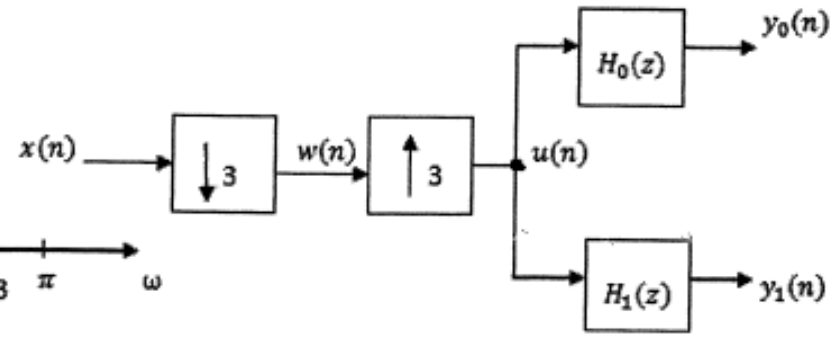

Fig. 1. b

b) With the help of suitable diagram mathematical equation show that decimation is a not a time invariant process. **6**

OR

10. a) What is the principle of Downsampling ? What is the important of antialiasing filter ? Derive the expression for decimated output signal i.e. y(m). **10**

    b) Draw block diagram and waveform of interpolator by an integer factor L and explain need of anti-image filter. **6**

11. a) Explain differences between microcontrollers and DSP processor. List the important features of TMS 320C6713 DSP Processor. **8**

    b) Explain the necessity of **8**

    i) Pipelining in DSP Processor.

    ii) VLIM architecture in DSP Processor.

OR

12. a) Draw block diagram of generalized DSP processor and explain. **8**

    b) Explain MAC and circular buffering architecture in DSP processors. **8**

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Seat No.	

T.E. (Instrumentation and Control) (Semester – I) Examination, 2014
CONTROL SYSTEM COMPONENTS
(2008 Course)

Time : 3 Hours Max. Marks : 100

Instructions : *a) Answer **3** questions from Section **I** and **3** questions from Section **II**.*
*b) **Neat** diagrams must be drawn **wherever** necessary.*
*c) Assume suitable data, **if necessary**.*
*d) Answers to the **two** Sections should be written in **separate** answer books.*

SECTION – I

1. a) Explain following with respect to Electromechanical Relay **10**
   1) Construction and working
   2) Various types
   3) Applications
   4) Selection Criteria.
   b) Explain Thumbwheel Switch in detail. Give its application. **8**

OR

2. a) Explain Reed Relay with following points **10**
   1) Diagram
   2) Working principle
   3) Construction
   4) Selection criteria.
   b) Explain level switch in detail. Give its application. **8**
3. a) Explain with neat sketch Jogging/Inching. Give its application. **8**
   b) Explain in detail.
   1) Short Circuit Protection.
   2) Over Temperature protection. **8**

OR

4. a) What is meant by Motor Control Center ? Explain in detail. **8**
   b) What is meant by Reversing Direction of motors ? Explain with neat diagram. **8**

P.T.O.

5. a) Explain pneumatic power supply with neat sketch. Explain each component in detail. **8**
   b) Compare pneumatic systems with electrical systems with respect to following points. **8**
      i) Power generated
      ii) Transmission Distance
      iii) Installation
      iv) Application and maintenance

OR

6. a) Explain 3/2 way valve and 4/3 way valve with diagram. How it is interfaced with speed control of double acting cylinder ? **8**
   b) State the necessity of FRL unit in a pneumatic system. Explain with neat sketch working of an oil lubricator. **8**

SECTION – II

7. a) It is required to have continuous reciprocation of double acting cylinder once signal (start) is given by operator. Design a hydraulic circuit diagram. **10**
   b) Explain Meter in and meter out Hydraulic circuit. **8**

OR

8. a) For a Hydraulic system implement a sequencing circuit for two double acting cylinders using standard Hydraulic Ckt symbols. **10**
   b) List the properties of fluids used in hydraulic systems. **8**
9. a) Explain construction, operation and working of Dampers. **8**
   b) Explain construction and working of HRC fuse. State its advantages and disadvantages. **8**

OR

10. a) State the use of i) High/low selector's ii) Computing Relays. Explain in detail. **8**
    b) What are different standard ISA sequences for Alarm Annunciator ? **8**
11. a) Explain in detail Sanitary pipe fitting w.r.t. i) SIP ii) CIP. **8**
    b) Explain tapered thread pipe fittings along with its application. **8**

OR

12. a) Explain hazardous area triangle and temperature classification as per NEC standards. **8**
    b) Explain Flanged pipe fittings along with its application. **8**

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Seat No.	

T. E. (Electrical) (Semester – I) Examination, 2014
ELECTRICAL INSTALLATION MAINTENANCE AND TESTING
(2012 Course)
(As Per Syllabus)

Time : 3 Hours Max. Marks : 70

Instructions *: 1) Answer Q 1 or Q 2, Q 3 or Q 4, Q 5 or Q 6, Q 7 or Q 8.*
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****.*

UNIT – I, II & III

1. a) State the basic causes of insulation degradation and explain how they affect the quality of insulation. **6**
   b) How transformer oil gets contaminated ? With suitable block diagram explain the reconditioning process of transformer oil. **7**
   c) Which are the faults occurred in induction motor ? What are the causes and remedies for them ? **7**

OR

2. a) Explain the preventive maintenance activities of induction motor which can be performed without actually dismantling the motor completely. **6**
   b) Discuss in detail various failure modes of transformer. **7**
   c) What is signature analysis ? How it is used for condition monitoring of induction motor ? **7**

UNIT – IV

3. a) Explain in detail tan δ measurement. **8**
   b) Explain in detail various causes of failure in power cables. **8**

OR

4. a) List out various methods for location of fault in power cable. Explain any one in detail. **8**
   b) Write a detail note on thermography and its use in condition monitoring of induction motor. **8**

UNIT – V

5. a) State and explain Kelvin's law. State limitations of Kelvin's law. **8**

P.T.O.

b) A single phase distributor has a resistance of 0.2 Ω and reactance of 0.3 Ω . At far end the voltage 'Vb' is 240 V. and current is 100 Amp at 0.8 p.f. lagging. At mid point 'a' the current is 100 Amp at 0.6 p.f. lagging with respect to voltage 'Va' at 'a'. Find supply voltage and phase angle between 'Vs' and 'Vb'. **10**

OR

6. a) Compare overhead and underground supply system stating their advantages and disadvantages. **8**

b) The cost /KM for each conductor of a section 'a' m2 for transmission line is (2800 + 1300a) the load factor of load current is 80% and the load factor for the loss is 65%. The rate of interest and depreciation is 10% and the cost of energy is 5 paisa/kwh. Find the most economical current density for transmission line by use of Kelvin's law. **10**

UNIT – VI

7. a) Explain in detail the function of the equipments used in substation. **6**

b) State and explain the factors which affect the soil resistivity. **4**

c) What are the essentials of estimating and costing ? **6**

OR

8. a) Draw the single line diagram of 11kV outdoor substation. Explain its earthing system. **6**

b) List the various bus bar systems and with neat sketch explain the single bus bar system with sectionalization. **4**

c) How the quantity of material required for internal wiring is determined ? **6**

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[4658] – 1

Seat No.	

T.E. (Civil) (Semester – I) Examination, 2014

STRUCTURAL ANALYSIS – II

(2008 Pattern)

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 logarithmic tables, sliderule, Mollier charts, electronic pocket calculator and steam tables is ***allowed****.*

SECTION – I

1. Analyse the portal frame as shown in fig. by slope deflection method. All the member have the same flexural rigidity. Refer Fig. 1. **18**

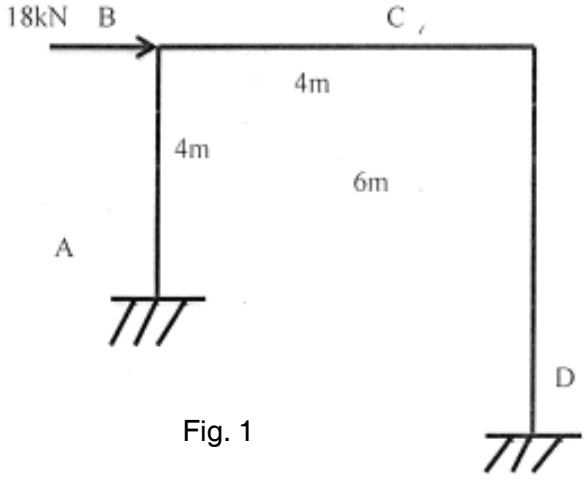

Fig. 1

OR

2. a) Analyze the continuous beam as shown in fig. by slope deflection method and draw SFD and BMD Refer Fig. 2 **12**

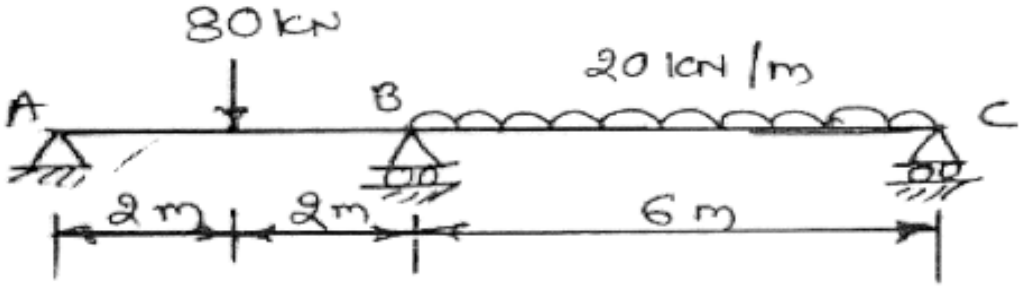

Fig. 2

b) Conceptual difference between sway and non sway frames. **6**

3. A continuous beam ABC fixed at the ends is loaded as shown in fig. find the reactions and support moments. Draw also B.M. and S.F. diagrams. Use moment distribution method for analysis. Refer Fig. 3 **16**

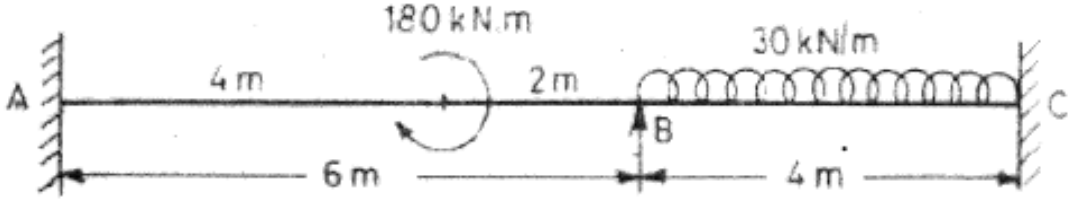

Fig. 3

OR

4. Using Moment Distribution method determine end moments of the members of a frame loaded and supported as shown in figure. EI is same throughout. Plot BMD. Refer Fig. 4 **16**

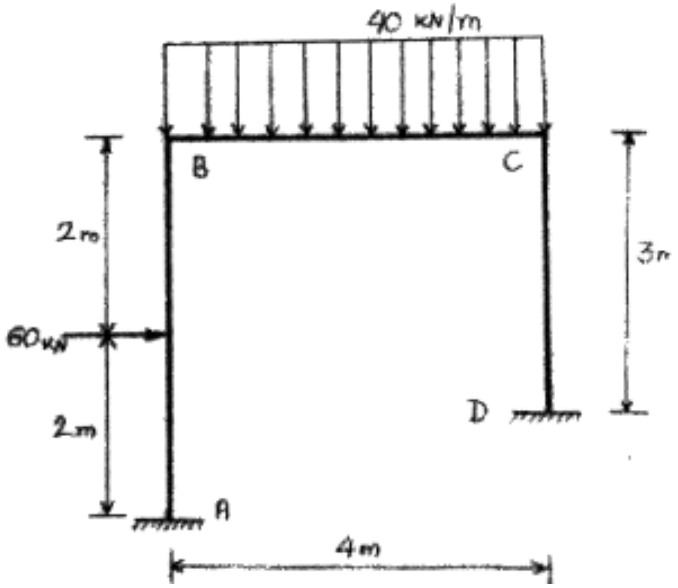

Fig. 4

5. A three-hinged parabolic arch ABC of span 30 m has its support A and B at different levels, A being at a higher level than B. The support A is 4 m below the crown hinge C and 12 m horizontally from A. The arch carries a uniformly distributed load of 30 kN/m from A to C determine the horizontal thrust and the vertical reactical reactions at the support. Find also the maximum bending moment for the arch. Refer Fig. 5 **16**

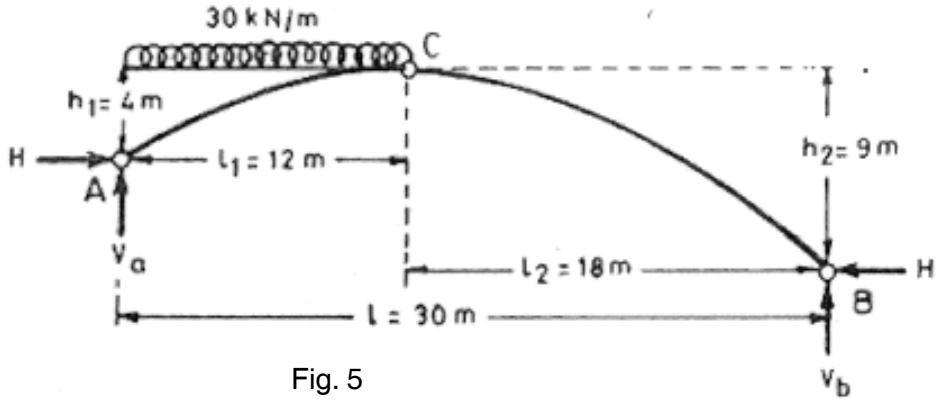

Fig. 5

OR

6. a) A two-hinged parabolic arch of spam 20 m and rise 4 m carries a uniformly distributed load of 50 kN/m on the left half of the span. Find the reactions at the position and amount of maximum bending moment. **8**

   b) A two hinged parabolic arch of spam 40 m and rise 8 m carries a point load of 80 kN at a distance of 10 m from the left support. Find the horizontal thrust at each support. Find also the maximum bending moment. Refer Fig. 6b **8**

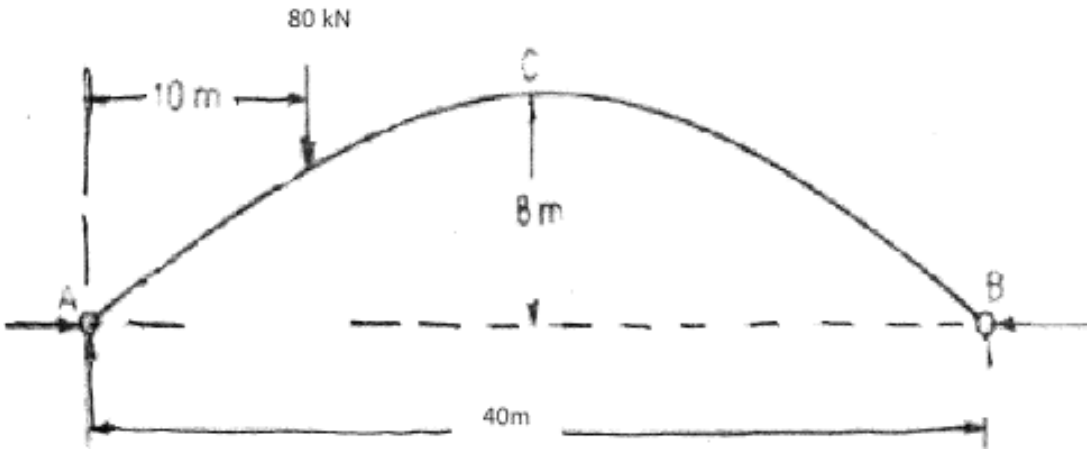

Fig.6b

SECTION – II

7. Using flexibility method find the forces in the members AE and CE of the truss as shown in fig. by taking these as a redundant. Axial rigidity for vertical and horizontal member is EA and for diagonal member is 2 EA. Refer Fig. 7. **18**

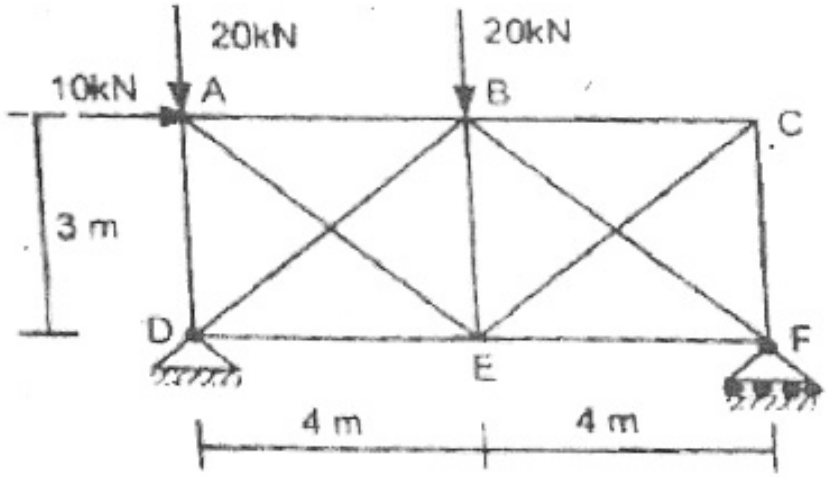

Fig. 7

OR

8. Analyze the rigid jointed plane frame supported and loaded as shown in fig. by flexibility method and draw BMD. Refer Fig. 8 **18**

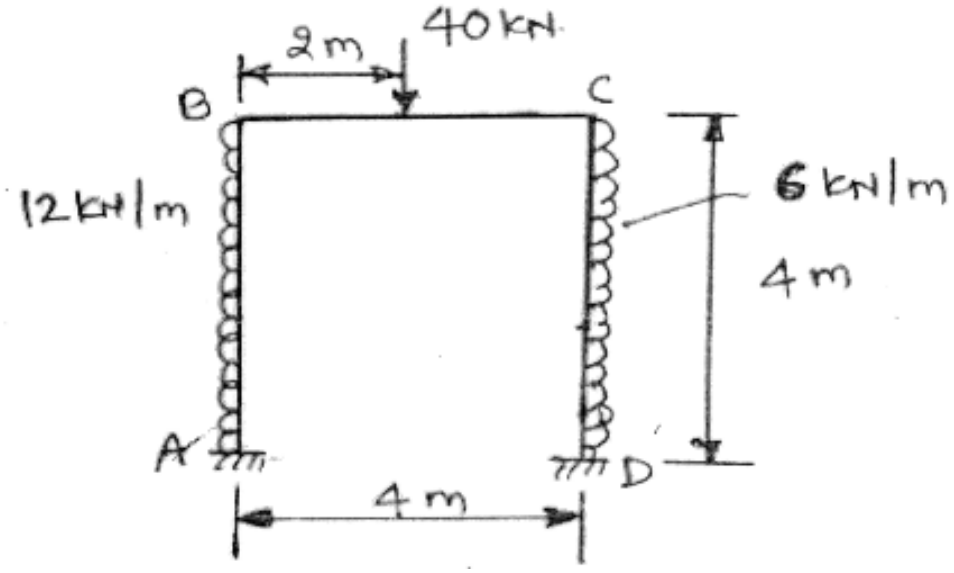

Fig. 8

9. Analyze the rigid jointed plane frame supported and loaded as shown in fig. by stiffness method. Draw BMD and Elastic curve. Take EI = Constant. Refer Fig. 9 **16**

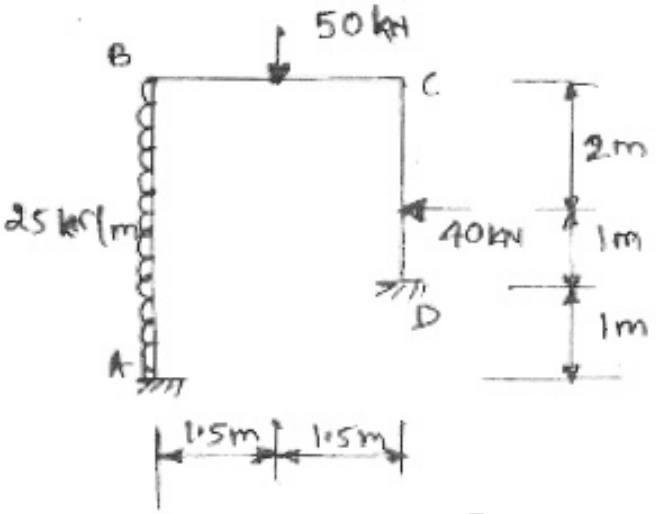

Fig. 9

OR

10. a) List out the property of stiffness matrix method. **4**

b) A continuous beam ABCD, fix at A and D and continuous over support B and C. Span AB = BC = CD = 5 meter each span is subjected to UDL of 10 KN/m, 20 KN/m, 30 KN/m respectively. In addition to concentrated point load of 100 KN in each span center. Analyze the beam by Stiffness Matrix method and draw SFD and BMD. **16**

11. a) A.R.C. frame has following details. **10**

Number of bays = 3,

Width of bay = 5 meter

Number of storeys = 3

Total height = 10.50 m

Floor height = 3.50 meter

$I_{beam} = I_{column}$

Horizontal load on each floor level = 30 KN.

(Forces are acting on all left hand side columns from left to right)

Analyze the frame by Portal method and draw Bending moments diagram, shear force and axial force are marked in the free body diagram of the frame.

b) A cantilever beam of span L is subjected to UDL of intensity w KN/m over entire span. Find deflection at free end of the beam by using finite difference method. **6**

OR

12. a) A beam supported at both ends having span 8 m . The beam carries uniformly distributed load of 10 KN/m over its entire span. Determine the central deflection in terms of its EI. Use finite difference method. Use five nodes. **6**

b) Determine the approximate values of bending moment, shear force, and axial force in the plane frame loaded as shown in fig. using cantilever method. The areas of cross-section of an interior column is 1.25 times the area of outer column. Refer Fig. 12b. **10**

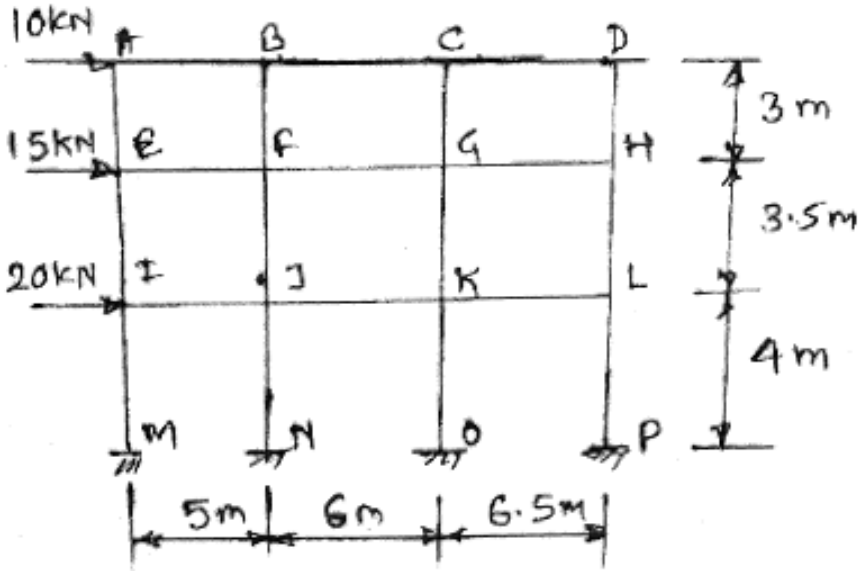

Fig. 12b

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Seat No.	

T.E. (Printing) (Semester – I) Examination, 2014
OFFSET MACHINES – I
(2008 Course)

Time : 3 Hours Max. Marks : 100

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

SECTION – 1

1. 1) What is the importance of packing under plate and blanket cylinders ? What type of gears are used in printing cylinders **8**

   2) Draw the structural design of the printing unit of sheetfed press indicating bearers, gears etc. **8**

OR

1. Explain the following with figures. **16**
   1) 4 ply blanket
   2) Sheet reversal in perfecting system
   3) 5 O'clock arrangement
   4) Pitch circle diameter.

2. 1) Explain an four factors affecting exposing of P.S. plates. **8**

   2) Explain the computer to plate workflow. Describe the steps. **8**

OR

2. 1) Explain the role of Silver halide layer in CTP plate. **8**

   2) Explain advantages and limitations of CTP plate technology. **8**

3. 1) Draw neat diagram of ink blade and ink duct. Explain each part. **9**

   2) Explain different rollers and the purpose of various rollers used in offset. **9**

OR

3. 1) State any 3 factors that define a good inking system. **9**

   2) Explain with neat figures **any 2**. **9**
      1) Ink drying in sheetfed lithography
      2) Multi roller drum inking
      3) Water in ink emulsification.

P.T.O.

SECTION – 2

4. 1) Explain Slip nip and Metering nip in continuous flow dampening. **9**

   2) State problems occurring due to incorrect roller setting in dampening. **9**

OR

4. 1) With help of diagram explain combination continuous flow dampening system. **9**

   2) Why relationship between pH, conductivity and concentration of dampening solution is important in offset ? Explain with reasons. **9**

5. 1) How does IR drying mechanism work ? Explain with neat diagram. **8**

   2) Explain tumbler grippers and their use. **8**

OR

5. Explain with neat figures :

   1) Blowers and suckers of single sheet feeder. **8**

   2) Suction head in stream feeder. **8**

6. 1) Explain steps involved in makeready to get good image quality. **8**

   2) Explain waste generated in press room due to ink and measures to reduce them. **8**

OR

6. Explain with figures : **16**

   1) Star target
   2) Dot gain scale
   3) Grey balance patches
   4) Register guides.

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Seat No.	

T.E. (Printing) (Semester – I) Examination, 2014
PRINTING NETWORK TECHNOLOGY AND OPTO ELECTRONICS
(2008 Course)

Time : 3 Hours | Max. Marks : 100

SECTION – I

1. A) Draw and explain block diagram of communication system. Explain necessity of modulation. **10**

   B) Explain Amplitude modulation and frequency modulation in detail. **8**

   OR

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

   1) Quantization

   2) Multiplexing technique

   3) Pulse amplitude modulation.

3. A) Explain data encryption and decryption. **8**

   B) Explain different types of fiber optic cable with suitable diagrams. **8**

   OR

4. A) Draw and explain block diagram of basic fiber optic communication system. **8**

   B) Explain different losses in fiber optic communication. **8**

5. A) Explain application of RFID in field of printing. **8**

   B) Explain different types of RFID. **8**

   OR

6. A) Explain Wi-Fi technology. **10**

   B) Explain any one application of optoelectronics in printing. **6**

SECTION – II

7. A) Explain different types operating system (OS). **10**

   B) Explain any four MKDIR, TOUCH, CP, MV UNIX commands with examples. **8**

   OR

P.T.O.

8. Write short notes on (**any three**) : **18**
   1) MAC operating system
   2) Design issues of operating system
   3) Windows NT
   4) Directory structure of UNIX.
9. Explain following protocols (**any two**) : **16**
   1) IMAP
   2) FTP
   3) DNS.

OR

10. A) Explain TCP/IP reference model. **8**
    B) Explain different types of local area network (LAN). **8**
11. A) Explain what is ISDN. **8**
    B) Explain Bridges and routers. **8**

OR

12. A) Explain modems and hubs. **8**
    B) Explain VPN and VSAT. **8**

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Seat No.	

T.E. (Printing) (Semester – I) Examination, 2014
DESIGN OF PRINTING MACHINE COMPONENTS
(2008 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) Explain creativity in design and explain step by step procedure for design of shaft on basis of ASME code. **8**

   b) Explain the BIS system of designation of steel. **8**

   OR

   a) State and explain the significance of service factor and overload factor. **8**

   b) The layout of an intermediate shaft of a gear box supporting two spur gears B and C is shown in figure. The shaft is mounted on two bearings A and D. The pitch circle diameters of gear B and C are 900 and 600 resp. The material of shaft is steel FeE 580 (S_{ut} = 770 N/mm^2 and S_{yt} = 580 N/mm^2). The factors Kb and Kt of ASME code are 1 : 5 and 2 resp. Determine the shaft diameter using ASME code. Assume that the gears are keyed to shaft. **8**

2. a) A flexible coupling, is used to transmit 15 kw power at 100 r.p.m. There are 6 pin and there pitch circle diameter is 200 mm. The length of the pin in contact with the left hand flang, the gap between the two flanges and the length of bush in contact with the right hand flang are 23,5 and 35 mm resp. The permissible shear and bending stress in the pin are 35 and 152 N/mm^2 resp. The permissible pressure for the rubber bush is 1 N/mm^2.

   Calculate :
   1) pin diameter by shear consideration.
   2) pin diameter by bending consideration.
   3) outer diameter of the rubber bush. **8**

   b) Explain step by step procedure for Knuckle joint. **8**

   OR

   a) Draw a neat sketch of cotter joint and also explain design of cotter joint. **8**

   b) Explain the term of FOS and factor to be consider while selecting FOS. **8**

P.T.O.

3. a) What is the importance of limits, fits in machine elements ? What are different type of tolerances ? Show how to give such a tolerance of machine elements. **8**

   b) State the procedure of designing a shaft as per following approaches : **10**
   i) Equivalent bending moment approach
   ii) Rigidity approach.

   OR

   a) Explain basic procedure of machine design. **8**

   b) Explain important factor of selecting coupling. **10**

SECTION – II

4. a) Prove that maximum efficiency of square threaded screw can be given by $\eta_{max} = 1 - \sin\theta / 1 + \sin\theta$. **8**

   b) What are the different types of stresses induced in power screw ? **8**

   OR

   a) Explain protected type rigid flange coupling. **8**

   b) Difference between welded joint and bolted joint. **8**

5. a) Explain construction and applications of recirculating ball screw. **8**

   b) Explain advantages and limitations of welded joint. **8**

   OR

   a) Explain the basic types of screw fastening. **8**

   b) Explain advantages and limitations of bolted joint. **8**

6. a) It is required to design a helical compression spring subjected to 1250 N. The deflection of the spring corresponding to the max force should be approximately 30 mm. The spring index can be 6, C = 6. The spring is made of cold drawn steel wire, the ultimate tensile strength and modulus of rigidity of the spring material are 1090 and 81370 N/mm^2. The permissible shear stress for the spring wire should be taken as 50% of the ultimate tensile strength. Design the strength and calculate is wire diameter,
   1) Wire diameter
   2) Mean coil diameter
   3) No. of active coils
   4) Total no. of coils
   5) Free length of the spring
   6) Pitch of spring coil.

   b) Derive the relation for deflection of helical torsion spring. **18**

   OR

   Write a short note on : **18**
   1) Load stress equation for helical spring
   2) Spring nomenclature
   3) Load-deflection derivation
   4) Types of spring.

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Seat No.	

T.E. (Mechanical) (Semester – I) Examination, 2014
MACHINE DESIGN – I
(2008 Course)

Time : 4 Hours | Max. Marks : 100

SECTION – I

1. A V-grooved pulley 200 mm pitch circle diameter is receiving 5 kW from a motor and rotates a shaft at 300 r.p.m. (figure 1). A crowned pulley, 500 mm in diameter, supplies power to a machine in a workshop. The angle of wrap for both pulleys is π and the coefficient of friction between belt and pulley is 0.3. The semi-groove angle for smaller pulley is 20°. For the material of shaft, E = 205 kN/mm^2, and G = 84 kN/mm^2. Shaft is made of carbon steel having s_{yt} = 267 N/mm^2 and s_{ut} = 530 N/mm^2. The pulleys are keyed to the shaft. Determine the diameter of shaft according to A.S.M.E. code. K_b = 1.5 and K_t = 2.0. Neglect centrifugal tension in belt. Check that $\theta < 0.5°$. **18**

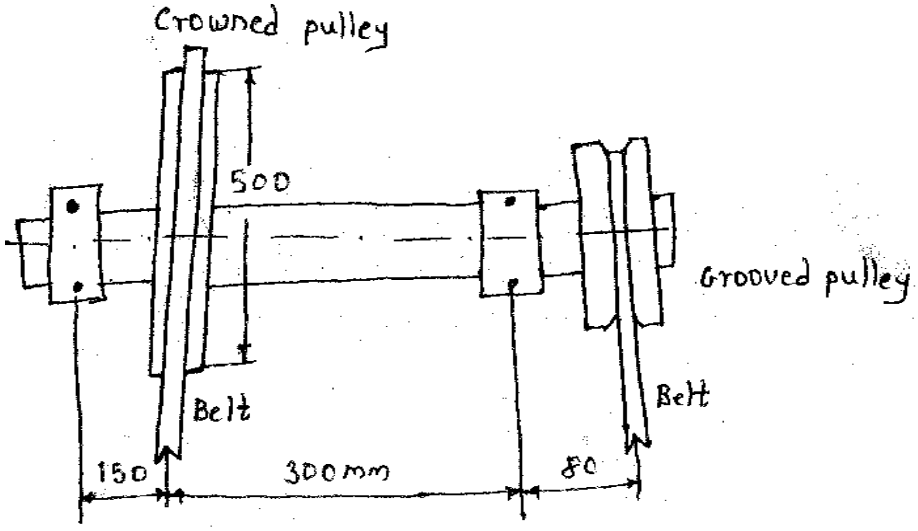

Figure 1

OR

2. a) Design a cost iron flange coupling for joining two mild steel shafts transmitting 100 kW of 250 rpm. The angle of twist is not to exceed 1° in a length of 25 diameters. Take allowable permissible shear stress for shaft is 40 MN/m^2 and for bolts is 28 MN/m^2. Allowable permissible shear stress for C1 flange is 15 MN/m^2. P.C.D. for bolls is 225 mm and no. of bolls are 6. G = 80×10^9 Pa.

   Standard values for shaft are 80, 85, 90, 95, 100, 105, 110, 115, 120 mm. **12**

   b) What are different types of keys ? Explain design of splines. **6**

P.T.O.

3. a) Explain selflocking and overhauling of power screw. **4**

   b) Following data refers for C-Clamp.

   - Maximum clamping force – 4 kN
   - Nominal diameter – 12 mm
   - Pitch of screw – 2 mm
   - Coefficient of screw friction – 0.12
   - Coefficient of collar friction – 0.25
   - Type of screw – Single start square thread
   - Mean collar radius – 6 mm
   - Operator force applied of the end of handle – 80 N
   - Distance between axis of handle and surface of nut in clamped condition – 150 mm
   - Nut height – 25 mm

   Determine :

   1) Dimensions of screw
   2) Total torque required to clamp the work piece
   3) Length of handle
   4) Stresses in two critical section of screw body
   5) Bearing pressure on threads. **12**

OR

4. a) Derive the expression for efficiency of square thread screw. Also obtain the equation for maximum efficiency. **6**

   b) A double threaded power screw with trapezoidal threads is used to raise the load of 300 kN. The nominal diameter is 100 mm and pitch 12 mm. The coefficient of friction at screw threads is 0.15.

   Neglect collar friction torque. Calculate

   1) Torque required to raise the load
   2) Torque required to lower the load
   3) Efficiency of the system.

   State weather screw is self locking or not. **10**

5. a) Explain with neat sketch, concept of following :

   1) Bolt of uniform strength
   2) Preloading of bolt. **8**

b) A steel plate subjected to a force of PKN and fixed to a vertical channel by using four identical bolt as shown in figure 2. Write down the procedure to find out diameter of bolts.

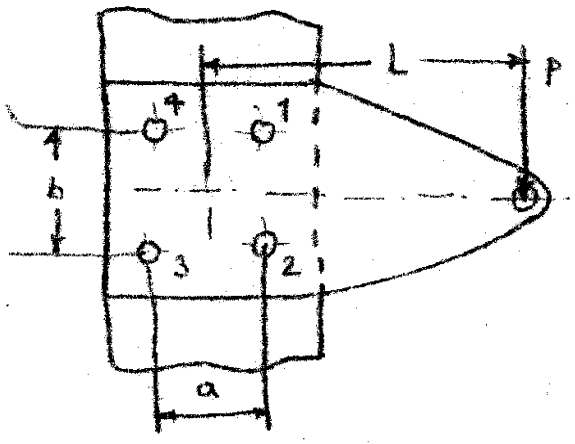

Figure 2 **8**

OR

6. a) What are the assumptions made in the design of welded joint, also discuss the design procedure for an eccentric loaded welded joint. **6**

b) A welded joint as shown in figure. 3 is subjected to an eccentric load 55.30 kN. A bracket is welded to the side of coloumn. Calculate the size of weld when maximum shear stress is 80 MN/m^2.

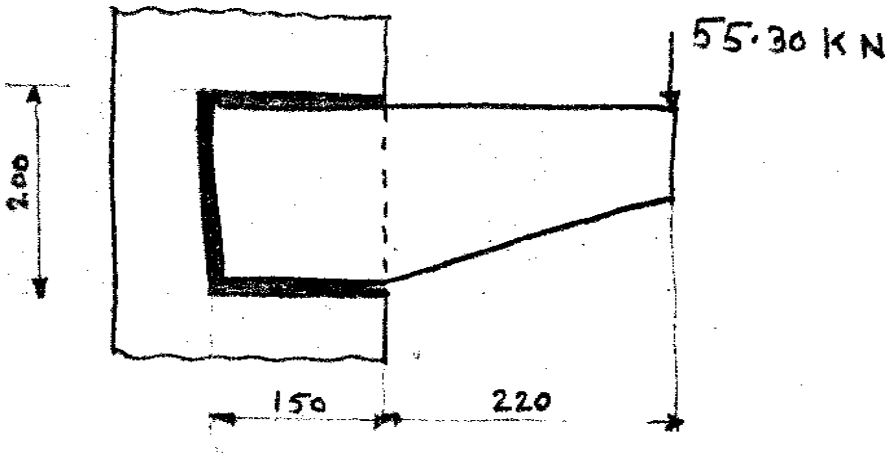

Fig. 3 (All d.m. are in mm) **10**

SECTION – II

7. a) State any two functions of Flywheel. State different materials used for Flywheel. **4**

   b) The torque developed by three cylinder engine running at 350 rpm is, 1

   $T_i = 16000 + 6000 \sin 3\theta$ –

   $T_o = 16000 + 3600 \sin \theta$ – (resisting torque)

   Where θ is crank angle.

   The coefficient of fluctuations of speed is 0.05 assume that MI of rim 95% of MI of Flywheel determine rim dimentions if b = 2t Rim Flywheel is made of cast iron with ρ = 7250 Kg/m^3, consider linear velocity is 25 m/s. **12**

OR

8. a) Compare solid disc Flywheel with rim Flywheel. **4**

   b) The areas of turning moment diagram for one revolution of multi cylinder engine with ref. to the mean turning moment below and above the line are, – 32, + 408, – 267, +333, – 310, + 226, – 374, +260 and – 244 mm^2. The mean speed is 300 rpm with I/O speed Fluctuations of $\pm$ 1.5%. If hoop stress in material of rim is not exceed 5.6 MPa. Determine the suitable diameter and c/s of flywheel assuming that b = 4t. Assume ρ = 7200 Kg/m^3. Neglect the effect of boss and arm. Assure scale 1mm = 2.4° and 1mm = 650 N–m on X & Y axis resp. **12**

9. a) Draw a neat sketch of multi leaf spring, show its essential parts. Also explain nipping of leaf spring. **8**

   b) A helical compression spring made of circular wire is subjected to an axial load of 3.5 kN. The deflection of spring should be approximately 5 mm. The spring index can be taken as 5 mm. The spring has square and ground ends. The spring is made of cold drawn steel wire with s_{ut} = 1050 N/mm^2 and modulus of rigidity 81370 N/mm^2. The permissible shear stress is taken as 50% of ultimate tensile strength. Design the spring and calculate :

   1) Wire diameter
   2) Mean coil diameter
   3) No. of active coils
   4) Total no. of coils
   5) Solid length of spring
   6) Free length of spring
   7) Actual spring rate. **10**

OR

10. a) Two helical springs are arranged in a concentric manner with one inside the other. Both spring have same free length and carries a load of 5500 N. The outer spring has 8 coils with mean coil diameter 128 mm and wire diameter 16 mm. The inner spring has 12 coils with mean coil diameter 84 mm and wire diameter 12 mm. Calculate :
    i) Maximum load shared by each spring
    ii) Total deflection of each spring
    iii) Maximum stress in each spring

    Assume modulus of rigidity 81×10^3 MPa. **12**

    b) A helical torsion spring subjected to axial load of 160 N. The mean radius of coil is 25 mm, radius of wire 2.5 mm and no. of effective turns are 6. Find the bending stress induced and the angular deflection in degree.

    Assume modulus of elasticity of spring material 210 GPa. **6**

11. a) Explain the selection of flat belt from manufacture's catalogue. **4**

    b) Two shaft whose centres are one meter apart are connected by V-belt drive. The driving pulley is supplying with 95 kW power and has an effectives diameter of 300 mm. It runs at 1000 rpm while driven pulley runs at 375 rpm. Angle of groove on pully is 40°. Permissible tension in 400 mm^2 cross sectional area of belt is 2.1 N/mm^2 and density of belt 1100 Kg/m^3. The driven pulley is overhauling. The distance of centre from the nearest bearing 200 mm. The coefficient of friction between the belt and pulley is 0.28. Calculate :
    1) No. of belts required
    2) Diameter of driven pulley shaft if Permissible shear stress is 42 MPa. **12**

OR

12. a) Explain construction of wire rope and lay of wire rope. **4**

    b) An extra flexible 8×19 plough steel wire rope of 38 mm diameter is used with 2m diameter hoist drum to lift 50 kN of load find the factor of safety under the following conditions. The wire rope is required to lift from a dept of 900 meters. The maximum speed is 3 m/s and acceleration is 1.5 m/s^2 when starting under no slack condition. The diameter of the wire is 0.05 d, where d is diameter of wire rope. The breaking strength of plough steel is 1880 N/mm^2 and modulus of elastisity of the entire rope is 84 GPa. The weight of rope is 53 N/m length. **12**

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Seat No.	

T.E. (Chemical Engineering) (Semester – I) Examination, 2014
CHEMICAL ENGINEERING THERMODYNAMICS – II
(2008 Course)

Time : 3 Hours Max. Marks : 100

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

SECTION – I

1. a) Explain various methods of determination of fugacity of pure gases. **8**

   b) The molar volumes of a binary solution at 25°C are measured as given below

X_1	0	0.2	0.4	0.6	0.8	1.0
$Vx10^6$ (m^3/mol)	20.0	21.5	24.0	27.4	32.0	40.0

   Using the method of tangential intercept, calculate the partial molar volumes of component 1 and 2 at i) $X_1 = 0.5$ ii) X = 0.75. **8**

OR

2. a) Show that the fugacity of a gas obeying the van der Waal's equation of state is given by

$$\ln f = \frac{b}{v-b} - \frac{2a}{RTV} + \ln \frac{RT}{v-b}$$

   where a and b are vander Waal's constants. **8**

   b) If the partial molar volumes of species 1 in a binary liquid solution at constant temperature and pressure is given by

$$\bar{V}_1 = V_1 + \alpha x_2^2$$

   derive the equation for $\bar{V}_2$. What equation for V is consistent with this ? **8**

3. a) Derive expression for volume, free energy, enthalpy and entropy change of mixing. **8**

   b) The excess enthalpy for a liquid mixture of species 1 and 2 at fixed T and P is represented by the equation

$$H^E = x_1 x_2 (40 x_1 + 20 x_2)$$

   Where H^E is in J/mol. Determine expressions for $\bar{H}_1^E$ and $\bar{H}_2^E$ as function of X_1. **8**

OR

P.T.O.

4. a) How activity coefficient is related to excess free energy ? Derive required equation. **8**

   b) The excess Gibb's free energy of a binary liquid at T and P is given by

   $$\frac{G^E}{RT} = (-2.6\, x_1 - 1.8\, x_2)\, x_1 x_2$$

   Find expression's for γ_1 and γ_2. **8**

5. a) Write short note on Azeotrope's. **4**

   b) Give statements of Raoults law, modified Raoults law and Henry's law and give their applications. **6**

   c) A mixture contains 45% (mol) methanol (A), 30% (mol) ethanol (B) and the rest n-propanol (C) liquid solution may be assumed to be ideal and perfect gas law is valid for the vapour phase. Calculate at a total pressure of 101.3 KPa.

   i) The bubble point and the vapour composition.

   ii) The dew point and the liquid composition.
   The vapour pressure of the pure liquids given below.

Temperature, K	333	343	353	363
P_A , KPa	81.97	133.29	186.61	266.58
P_B , KPa	49.32	73.31	106.63	166.61
P_C , KPa	39.32	62.65	93.30	133.29

8

OR

6. a) Derive the expressions of phase rule for non-reacting system and Duhem theorem. **6**

   b) The vapour pressure of acetone,acetonitrile and nitro-methane can be represented by

   Antoine equations as $\ln P_1^s = 14.3916 - \frac{2795.82}{T+230}$ $\ln P_2^s = 14.2724 - \frac{2945.47}{T+224.0}$

   $\ln P_3^s = 14.2043 - \frac{2972.64}{T+209.0}$

   Where P_1^s, P_2^s and P_3^s are in KPa and T is in °C. Assume that the system follows Raoult's law, calculate

   i) P and y_1 at T = 75°C, x_1 = 0.30, x_2 = 0.40

   ii) P and x_1 at T = 80°C, y_1 = 0.45, y_2 = 0.35. **12**

SECTION – II

7. a) Explain any two methods of consistency tests for VLE Data. **8**

   b) The azeotrope of the ethanol – benzene system has a composition of 44.8% (mol) ethanol with a boiling point of 341.4 K at 101.3 KPa. At this temperature the vapour pressure of benzene is 68.9 KPa and the vapour pressure of ethanol is 67.4 KPa. What are the activity coefficients in a solution containing 10% alcohol ? **10**

OR

8. a) Explain osmotic pressure and osmotic equilibrium. **8**

   b) Derive the following expression for solid-liquid equilibrium

$$\psi_i = \exp \int_{Tmi}^{T} \frac{H_i^l - H_i^s}{RT^2} dt$$

   where, $\psi_i = f_i^s / f_i^l$

   H_i^l and H_i^s are the molar enthalpies for the species 'i' in the liquid and solid phase. T_{mi} is the melting temperature (freezing point) of pure species 'i'. **10**

9. a) Derive an expression showing the effect of temperature on equilibrium constant. **8**

   b) n-Butane is isomerised to 1-butane by the action of catalyst at moderate temperatures. It is found that the equilibrium is attained at the following composition.

Temperature K	Mol %, n-butane
317	31.00
391	43.00

   Assuming that activities are equal to the mole fractions , calculate the standard free energy of the reaction at 317 K and 391 K and average value of heat of reaction over this temperature range. **8**

OR

10. a) In a chemical laboratory it is decided to carry out the reaction at 1 bar and 298 K.

$$C_2H_5OH_{(g)} = \frac{1}{2} O_{2(g)} \rightarrow CH_3CHO_{(g)} + H_2O_{(g)}$$

   Calculate the standard Gibb's free energy change at 298 K and predict whether it is feasible to carry out the given reaction or not. If possible, then calculate the equilibrium constant. Given data. **8**

ΔG_f^o, CH_3CHO = – 133.978 KJ

ΔG_f^o, H_2O = – 288.60 KJ

ΔG_f^o, C_2H_5OH = – 174.883 KJ

b) Determine the number of degrees of freedom for each of following systems

i) A system of two miscible non reacting species which exists as an azeotrope in VLE.

ii) A system prepared by partially decomposing $CaCO_3$ into an evacuated space.

iii) A system prepared by partially decomposing NH_4Cl into evacuated space.

iv) A system consisting of the gases CO, CO_2, H_2, H_2O and CH_4 in chemical equilibrium. **8**

11. a) Explain in detail

i) Multireaction equilibria

ii) Relation of equilibrium constant to composition. **10**

b) The following reaction takes place in a system consisting of 3 mol CH_4, 1mol H_2O, 1 mol CO and 4 mol H_2 initially

$CH_4 + H_2O \rightarrow CO + 3H_2$

Express the composition of the mixture in terms of mole fraction as a function of extent of reaction. **6**

OR

12. a) Acetic acid is esterified in the liquid phase with ethanol at 100°C and atmospheric pressure to produce ethyl acetate

$CH_3COOH_{(l)} + C_2H_5OH_{(l)} \rightarrow CH_3COOC_2H_{5\,(l)} + H_2O_{(l)}$

If initially there is one mole of each acetic acid and ethanol, estimate the mole fraction of ethyl acetate in the reaction mixture at equilibrium. Data for standard enthalpies and Gibb's free energies of formation for all the chemical species at 25°C are given as follows.

Chemical Species	**$\Delta H_f°$ (KJ)**	**$\Delta G_f°$ (KJ)**
CH_3COOH (l)	– 484.500	– 389.900
C_2H_5OH (l)	– 277.690	– 174.780
$CH_3COOC_2H_5$ (l)	– 463.25	– 318.280
H_2O (l)	– 285.830	– 237.129

12

b) Write a note on feasibility of a chemical reaction. **4**

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Seat No.	

T.E. (Petroleum Engineering) (Semester – I) Examination, 2014
DRILLING OPERATIONS
(2008 Course)

Time : 3 Hours | Max. Marks : 100

Instructions : *1) Question no.* ***4*** *and Q.No.* ***8*** *are* ***compulsory****.*
2) Answer ***three*** *questions from* ***each*** *Section.*
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) Discuss any one drilling rig system with illustrative figure. **8**

   b) Discuss IADC classification of drilling bits. **8**

2. a) Discuss differential stuck up and mechanical stuck up in detail. **10**

   b) Well depth is 9000 ft, drilled with 10 ppg mud. Calculate bottom hole pressure. **2**

   c) Convert 0.5 psi/ft to ppg and 11 ppg to gradient. **2**

   d) If SIDPP = 200 psi, SICP = 264 psi, Well depth 8800 ft., Mud weight used is 9.9 ppg. Find out kill mud weight. **2**

3. a) Draw BOP and discuss different Ram preventers and annular preventer. **8**

   b) Discuss different types of Multilateral wells and horizontal wells. **8**

4. a) Write short note on :
   i) casing spear
   ii) coring
   iii) Dogleg and key seat
   iv) Tripping operations. **18**

SECTION – II

5. a) Discuss Casing policy and different types of casing threads. **8**

   b) Discuss primary cementation process and different additives used in cement slurry. **8**

6. a) Discuss water base mud rheological properties in detail. **8**

   b) It is required to reduce the mud weight from 3 gm/cc to 2.71 gm/cc in order to combat loss circulation problem. Calculate volume of water and oil required to bring this reduction. Volume of mud is 100 m^3. Density of oil 0.82. **8**

P.T.O.

7. a) Draw circulation diagram and discuss functions of hydraulics. **8**

   b) Data given :

   Mud weight = 14.5 ppg, Flow rate = 300 gpm, jet sizes $3 \times 12/32''$. Calculate BHHP. **4**

   c) Discuss different flow models in brief. **4**

8. Write short notes on :

   i) Balance plug

   ii) Mud contaminants

   iii) Squeeze cementation. **18**

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Seat No.	

T.E. (Petroleum) (Semester – I) Examination, 2014
HYDROCARBON PROPERTIES AND THERMODYNAMICS
(2008 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** answer books.*
*3) Figures to the **right** indicate **full** marks.*
*4) **Use** of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam table is **allowed**.*
*5) Assume suitable data, if **necessary**.*

SECTION – I

1. a) Distinguish between state function and path function with examples. **6**

   b) Air, initially at 389 K and 8 bar is expanded reversibly and isothermally to such a pressure that when it is cooled to 278 K at constant volume, its pressure is 2 bar. Assume air to be an ideal gas with Cp= 29.3 J/mol. K. Calculate the work and change in internal energy. **6**

   c) Prove that internal energy is a state function. **6**

   OR

2. a) What are the limitations of the first law of thermodynamics ? How does the second law overcome them ? **6**

   b) Ten kilograms of water at 375 K is mixed adiabatically with 30 kg of water at 275 K. What is the change in entropy ? Assume that the specific heat of water is 4.2 kJ/kg K and is independent of temperature. **6**

   c) Write a note on the Clausius inequality. **6**

3. a) Classify reservoir fluids. Draw schematic sketches of the phase envelopes for each of them. **4**

   b) Give the necessity for equations of state for real gases. Explain any one of the equations of state for real gases. **6**

   c) Determine the van der Waals constants and the molar volume of ethane at the critical point, given that the critical temperature and pressure are respectively 305.2 K and 49.4 bar. **6**

   OR

P.T.O.

4. a) Define : Cricondentherm, Cricondenbar, Critical point, Phase envelope. **8**

   b) Determine the molar volume of gaseous methane at 300 K and 600 bar by using the van der Waals equation given that 'a' = 0.2285 Nm^4/mol^2 and 'b' = 4.27×10^{-5} m^3/mol. **8**

5. a) What are Maxwell relations ? What is their importance in establishing relationships between thermodynamic properties ? **8**

   b) Carbon tetrachloride boils at 349.75 K at 1 bar. Its latent heat of vaporization is 194.8 kJ/kg. What would be the boiling point of carbon tetrachloride at 2 bar ? **4**

   c) Define : Helmholtz free energy and Gibbs free energy. Give the significance of each of them. **4**

OR

6. a) Explain the need for partial molar properties. Explain any one method to determine partial molar property. **8**

   b) At 200 K, the compressibility factor of oxygen varies with pressure as given below. Evaluate the fugacity of oxygen at this temperature and 100 bar. **8**

P,bar	1	4	7	10	40	70	100
Z	0.997	0.988	0.978	0.969	0.873	0.776	0.687

SECTION – II

7. a) For each of the following non-reactive equilibrium systems, determine the number of available degrees of freedom using the phase rule. **8**

   i) A mixture of air and methane in contact with a solid adsorbent at atmospheric pressure and a specified temperature.

   ii) Two miscible materials in vapour liquid equilibrium with vapour composition specified at a given temperature and pressure.

   iii) Liquid water in equilibrium with a mixture of water vapour and nitrogen.

   iv) A mixture of benzene and toluene in equilibrium with its vapour at 1 bar.

b) A hydrocarbon mixture contains 25% (mol) propane, 40% (mol) n-butane and 35% (mol) n-pentane at 1447.14 kPa. Assume ideal solution behaviour and calculate : **10**

i) Bubble point temperature

ii) Dew point temperature

Use the following data for K values (Intermediate values can be found by interpolation)

	K values			
	T = 355 K	**T = 366 K**	**T = 377 K**	**T = 388 K**
Propane	2	2.3	2.6	2.9
n-Butane	0.78	0.9	1.1	1.3
n-Pentane	0.33	0.4	0.5	0.61

OR

8. a) Given a mixture of known overall composition z_i, at temperature T and pressure P, derive expressions for finding vapour (V) and the compositions of the liquid and vapour phases in equilibrium . i.e. to solve the problem of flash vaporization. **8**

b) A binary system of acetone (1) and acetonitrile (2) conforms closely to Raoult's law. Using the vapour pressure data given below plot the T-x-y curve and the equilibrium curve. **10**

T, K	311.45	315	319	323	327	331	335.33
P_1^s, kPa	53.32	61.09	70.91	81.97	94.36	108.2	124.95
P_2^s, kPa	21.25	24.61	28.90	33.79	39.35	45.62	53.32

9. a) Write a note on the Klinkenberg effect. **4**
   b) Define saturation. Hence explain connate water saturation. **6**
   c) Define wettability. Give its significance in reservoir engineering. **6**

OR

10. a) What are saturation curves ? Explain the phenomena of drainage and imbibitions with the help of saturation curves. **8**
    b) Derive the Kelvin's equation for lowering of vapour pressure of pure substances on curved interfaces. **8**
11. a) Explain the various models of wax precipitation. **8**
    b) With the help of a neat phase diagram, explain the formation of gas hydrates. **8**

OR

12. a) What are asphaltenes ? Explain with a diagram the possible locations of the formation and deposition of asphaltenes in a production system. **6**
    b) Draw and explain a typical Asphaltene Precipitation Envelope (APE). **6**
    c) Explain eutectic point in the solid liquid equilibrium diagram. **4**

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Seat No.	

T.E. (Mech., Automobile, Mech. S/W) (Semester – I) Examination, 2014
HEAT TRANSFER
(2008 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** 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) **Use** of external data books is **not** allowed.*
*7) Assume suitable data, if **necessary**.*

SECTION – I

Unit – I

1. a) Explain in brief the analogy between heat flow and electricity with its significance. **4**

   b) An immersion water heater of surface area 0.1 m^2 and rating 1 kW is designed to operate fully submerged in water. Estimate the surface temperature of the heater when the water is at 40°C and h_{water} = 300 W/m^2K. If this heater is by mistake used in air at 40°C with h_{air} = 9 W/m^2K, what will be the surface temperature ? **4**

   c) Derive a general three dimensional heat conduction equation in Cartesian coordinate system. Reduce it as 1) Poisson equation, 2) Fourier equation, 3) Laplace equation. **10**

OR

2. a) A brick wall (k = 1.5 W/mK) 0.20 m thickness separates hot combustion gases of a furnace from outside ambient air which is at 25°C. The outer surface temperature of brick wall is found to be 100°C. If natural convection heat transfer coefficient on the outside surface of brick wall is 25 W/m^2K, $\varepsilon = 0.85$, calculate inner surface temperature of brick wall. **8**

   b) Explain the significance of **6**
      i) Thermal diffusivity
      ii) Thermal conductivity
      iii) Overall heat transfer coefficient.

   c) Explain different types of Insulating materials. **4**

P.T.O.

Unit – II

3. a) Define critical radius of insulation. Explain why an insulated small diameter wire has a higher current carrying capacity than an uninsulated one. **8**

   b) A plane wall of thickness 0.1 m and k = 25 W/mK, having uniform volumetric heat generation of 0.3 MW/m^3 is insulated on one side and is exposed to a fluid at 92°C. The convective heat transfer coefficient between the wall and the fluid is 500 W/m^2K. Determine :
      i) the maximum temperature in the wall
      ii) temperature at the surface exposed to the fluid
      iii) draw the temperature profile. **8**

OR

4. a) An electrical conductor of 10 mm diameter insulated by PVC (k = 0.18 W/mK) is located in air at 30°C having convective heat transfer coefficient of 7.8 W/m^2K. If surface temperature of base conductor is 85°C, find
      i) Current carrying capacity of conductor when 2 mm thick insulation is provided (take resistivity of conductor = 70 $\mu\Omega$cm),
      ii) Critical insulation thickness,
      iii) Max. current carrying capacity,
      iv) % increase in current carrying capacity by providing critical insulation. **8**

   b) A steel pipe (k = 50 W/mK) of 100 mm I.D and 110 mm O.D is to be covered with two layers of insulation each having thickness of 50 mm. The thermal conductivity of first insulation material is 0.06 W/mK and that of the second is 0.12 W/mK. Estimate heat loss per meter length of pipe when temperature of inside tube surface is 523 K and that of outer surface is 323 K. If order of insulation is reversed, calculate change in heat loss with all other conditions kept unchanged. Comment on results. **8**

Unit – III

5. a) Pin fin are provided to increase the heat transfer rate from a hot surface. Which of the following arrangement will give higher heat transfer rate : **6**
      i) 6 fins of 10 cm length or
      ii) 12 fins of 5 cm length take k_{fin} = 200 W/m°C, h = 20 W/m^2°C, Cross section area of fin = 2 cm^2, Perimeter = 4 cm, fin base temp. = 230°C, surrounding air temp. = 30°C. For analysis, use fin with insulated tip condition.

   b) Explain difference between fin efficiency and fin effectiveness. **4**

   c) A mercury thermometer is being used for measuring temperature of a fluid which changes within a time period less than 3 seconds. State the suitability of this arrangement by assuming bulb of thermometer as sphere of 1 mm diameter having k = 10 W/mK, $\alpha = 5\times10^{-5}$ m^2/s, h = 10 W/m^2K. Find diameter of thermocouple junction used for the same purpose in same environment. $K_{thermocouple}$ = 90 W/mK, $\alpha_{thermocouple} = 25\times10^{-5} m^2/s$. **6**

OR

6. a) State assumptions made in lumped capacitance method. Using this method derive the following relation : $(T - T_a)/(T_i - T_a) = e^{-(Bi\ Fo)}$ with usual notations. **8**

   b) Fins are more effective, when provided on the surface for which film heat transfer coefficient is smaller. Explain. **4**

   c) Explain difference between Biot number and Nusselt number. **4**

SECTION – II

Unit – IV

7. a) Explain : **8**
   i) Planck's Distribution Law of Radiation
   ii) Wien's Displacement Law of Radiation
   iii) Stefan-Boltzmann Law of Radiation
   iv) Kirchhoff's Law of Radiation.

   b) Two concentric spheres, A and B, of diameters 0.2 m and 0.3 m respectively, with pace between them is evacuated are used for storing liquid oxygen. The liquid oxygen is stored inside the sphere 'A' at a temperature of – 153°C.

   The surface of spheres 'A' and 'B' facing each other are highly polished. ($\varepsilon = 0.04$). Latent heat of vaporization of liquid gas is 209 KJ/kg. If the system is kept in a space vehicle having temperature 300 K, calculate the rate of evaporation of liquid oxygen per hour. **8**

OR

8. a) Write short notes on : **8**
   1) Shape factor
   2) Radiation shields.

   b) Two large parallel planes with emissivity 0.6 are at 900 K and 300 K. A radiation shield with one side polished and having emissivity of 0.05 while the emissivity of other side 0.4 is proposed to be used. Which side of the shield should face the hotter plane if the temperature of the shield is to be kept minimum ? Justify your answer. **8**

Unit – V

9. a) Explain with a neat sketch development of Hydrodynamic boundary layer and thermal boundary layer assuming constant wall temperature, for fluid flow through a conduit. **6**

   b) A refrigerated truck on the highway is moving at a speed of 90 km/hr in a desert area where the air temperature is 70°C. The body of the truck can be assumed as rectangular box 9 m long, 3 m wide and 2 m high. **10**

   Consider the boundary layer is turbulent over all the surfaces and temperature of the surfaces is 10°C. Neglecting the heat transfer from front and back end of the truck, find,
   1) Heat transfer coefficient for this situation.
   2) Heat loss per hour from the surfaces °C.

   Data : $\rho = 1.128$ kg/m^3 Cp = 1.007 kJ/kg K,

   Kinematic viscosity = 16.96×10^{-6} m^2/sec, k = 0.027 W/mK

   Use the following correlation,

   $N_u = 0.036\ Re^{0.8}\ Pr^{0.33}$

OR

10. a) Discuss the thermal analysis for constant wall flux and constant wall temperature boundary conditions and draw the variations in the wall temperature and fluid temperature along the length of the tube for both cases. **6**

b) A pipe, 8 cm in diameter is covered with a 3 cm thick layer of insulation, which has surface emissivity of 0.9. The surface temperature of the insulation is 80°C and the pipe is placed in air at 20°C. Considering heat loss by radiation and natural convection, Estimate,

i) The heat loss from 5 m length of pipe
ii) The overall heat transfer coefficient
iii) Heat transfer coefficient due to radiation. Use the following properties and correlations

ρ = 1.092 kg/m^3 Cp = 1.007 kJ/kg k, Dynamic viscosity = 19.57×10^{-6} m^2/sec, k = 0.02781 W/mK. **10**

$Nu = 0.53\ (Gr.\ Pr)^{1/4}$ for $10^4<Gr.Pr<10^7$

$Nu = 0.15\ (Gr.Pr)^{1/3}$ for $10^7<Gr.Pr<10^{10}$

Unit – VI

11. a) What is the difference between pool boiling and flow boiling ? What is the difference between subcooled and saturated boiling ? Draw the boiling curve and identify the different boiling regimes. Also, explain the characteristics of each regime. **8**

b) A chemical of specific heat = 3.6 kJ/kgK enters a parallel flow heat exchanger at 100°C at a flow rate of 30,000 kg/hr. Cooling water (specific heat = 4.2 kJ/kgK) enters the heat exchanger at 10°C at a flow rate of 50000 kg/hr. Heat transfer area of the heat exchanger is 10 m^2. Over all heat transfer coefficient can be taken as 1000 W/m^{2}K. Find **10**

1) The effectiveness of the heat exchanger.
2) Outlet temperatures of both chemical and water.

OR

12. a) Explain the following : **9**

i) Fouling in heat-exchangers
ii) NTU
iii) Heat exchanger effectiveness.

b) In an open heart surgery, under hypothermic conditions, the patient's blood is to be cooled before the surgery and rewarmed afterwards. It is proposed that a concentric tube, counter flow heat exchanger of length 0.5 m is to be used for this purpose with a thin walled inner tube having a diameter of 55 mm. If the water at 60°C and 0.10 kg/s is used to heat the blood entering the exchanger at 18°C and 0.05 kg/s, what is the temperature of blood leaving the heat exchanger ? The overall heat transfer coefficient can be taken as 500 W/m^{2}K, and specific heat of blood is 3500 J/kgK. **9**

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Seat No.	

T.E. (Petrochemical Engineering) (Semester – I) Examination, 2014
APPLIED HYDROCARBON THERMODYNAMICS
(2008 Course)

Time : 3 Hours Max. Marks : 100

Instructions : *1) Answers to the **two** Sections should be written in **separate** answer books.*
*2) Answer Q. **1** or Q. **2,** Q. **3** or Q. **4,** Q. **5** or Q. **6,** Q. **7** or Q. **8,** Q. **9** or Q. **10**, Q. **11** or Q. **12**.*
*3) Neat diagrams must be drawn **wherever** necessary.*
*4) Figures to the **right** side indicate **full** marks.*
*5) Use of calculator is **allowed**.*
*6) Assume suitable data if **necessary**.*

SECTION – I

1. a) Prove that internal energy is a state function. **6**

   b) What do you mean by a cyclic process ? State and explain the first law of thermodynamics for cyclic process. **6**

   c) State and prove the Clausius inequality. **6**

OR

2. a) A mercury manometer used to measure pressure inside a vessel indicates 400 mm. One end of the manometer is exposed to the atmosphere. The atmospheric pressure is 1.01325 bar. Density of mercury is 13.56×10^3 kg/m^3 and g = 9.81 m/s^2. What is the absolute pressure in the vessel in N/m^2 ? **6**

   b) State and explain the third law of thermodynamics. Give its significance. **6**

   c) How do you obtain the inversion curve in Joule Thomson Expansion ? Give its significance. **6**

3. a) Using the Redlich Kwong equation, calculate the pressure of 0.5 kg of gaseous ammonia contained in a vessel of 0.03 m^3 at a constant temperature of 338 K. The critical temperature and pressure are 405.5 K and 112.8 bar. **8**

   b) Define Compressibility Factor. State the principle of corresponding states and hence explain the use of compressibility charts. **8**

OR

4. a) What is the need for real gas equations of state ? Enlist any four equations of state for real gases. Explain any one of them. **10**

   b) In case of ideal gases, write the expressions for work done and the heat supplied in (a) Constant Pressure Process (b) Constant Temperature Process (c) Adiabatic Process. **6**

P.T.O.

5. a) Write a note on reference properties, energy properties and derived properties. **8**

   b) Define Helmholtz free energy and prove that at constant temperature the decrease in work function measures the maximum work available from a given change of state. **8**

OR

6. a) Calculate the vapour pressure of water at 363 K, if the vapour pressure at 373 K is 101.3 kPa. The mean heat of vaporization in this temperature range is 2275 kJ/kg. **6**

   b) What do you mean by fugacity ? Define fugacity coefficient. Give its significance. Density of gaseous ammonia at 473 K and 50 bar is 24.3 kg/m^3. Estimate its fugacity. **10**

SECTION – II

7. Mixtures of n-Heptane (A) and n-Octane (B) are expected to behave ideally. The total pressure over the system is 101.3 kPa. Using the vapour pressure data given below. **18**

   i) Construct the boiling point diagram

   ii) The equilibrium diagram

T, K	371.4	378	383	388	393	398.6
$P_{A,}$ kPa	101.3	125.3	140	160	179.9	205.3
$P_{B,}$ kPa	44.4	55.6	64.5	74.8	86.6	101.3

OR

8. a) Explain the procedure for obtaining dew point and bubble point of a multicomponent mixture. **9**

   b) What are azeotropes ? Give their significance in process industries. Discuss maximum and minimum boiling azeotropes. **9**

9. a) Write a note on Margules equation. **8**

   b) What are partial molar properties ? Give the methods for determining the partial molar properties. **8**

OR

10. Ethyl alcohol and hexane form an azeotrope at 33.2% (mol) ethanol. It boils at 331.9 K at 101.3 kPa. At 331.9 K, the vapour pressures are 44.25 kPa for ethanol and 72.24 kPa for hexane. Determine : **16**

    i) The van Laar constants

    ii) The vapour composition for a solution containing 50% (mol) hexane boiling at 331.9 K

    iii) The total pressure for the conditions in part (ii).

11. One mole of steam undergoes the water-gas shift reaction at a temperature of 1100 K and a pressure of 1 bar.

$CO_{(g)} + H_2O \rightarrow CO_{2\ (g)} + H_{2(g)}$

The equilibrium constant for the reaction is K = 1. Assuming ideal gas behavior, calculate the fractional dissociation of steam in the following cases and discuss the effect of the presence of excess reactant on the extent of reaction. **16**

i) CO supplied is 100% excess of stoichiometric requirement.

ii) CO supplied is only 50% of the theoretical requirement.

OR

12. a) Write a note on Phase rule for reacting systems. What do you mean by the number of independent reactions in an interacting system ? How are they determined ? **8**

b) Discuss the effect of pressure on equilibrium constant and equilibrium composition. **8**

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Seat No.	

T.E. (Polymer Engineering) (Semester – I) Examination, 2014
MASS TRANSFER AND REACTION ENGINEERING
(2008 Course)

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 the **right** indicate **full** marks.*
*4) Assume suitable data, if **necessary**.*
*5) Use of logarithmic table, electronic pocket calculators is **allowed**.*

SECTION – I

1. a) Explain Fick's law for molecular diffusion and prove that for Equimolar Counter diffusion for binary gas mixture of A and B $D_{AB} = D_{BA}$. **9**

   b) Derive the necessary expression for Steady State diffusion of gas A through non-diffusing gas B. **9**

OR

2. a) Find $D_{N2\text{-Gas mix}}$ if the gas mixture composition by volume % is as follows : **9**

   N_2 = 67%, CO_2 = 16%, CO = 11%, O_2 = 6% at 373 °K, 1.5 atm pressure.

   Data : $D_{N_2 - O_2}$ = 18.15 × 10^{-6} m^2/sec at 373 °K, 1.5 atm pressure.

   $D_{N_2 - CO}$ = 19.15 × 10^{-6} m^2/sec at 373 °K, 1.5 atm pressure.

   $D_{N_2 - CO_2}$ = 15.15 × 10^{-6} m^2/sec at 373 °K, 1.5 atm pressure.

   b) Write a note on Analogies between Heat and Mass Transfer. Explain the term Mass transfer Operation with two important applications. **9**

3. a) Write a note on minimum liquid to gas ratio for gas absorber. **8**

   b) Write a note on a) Liquid-Liquid extraction, b) "Choice of Solvent" for gas Absorption. **8**

OR

4. a) Explain Raoult's Law and calculate the vapor liquid compositions in equilibrium at 368 °K for benzene-toluene using the vapor pressure data at 101.32 kPa.

   Vapor Pressure of Benzene = 155.7 kPa and Vapor Pressure of Toluene = 63.3 kPa. **8**

P.T.O.

b) Discuss the term Relative Volatility and Calculate the variation in relative volatility for benzene-toluene system at 85 °C and 105 °C.

Vapor Pressure of Benzene = 116 kPa and Vapor Pressure of Toluene = 46 kPa at 85 °C and at 105 °C Vapor Pressure of Benzene = 204 kPa and Vapor Pressure of Toluene = 86 kPa. **8**

5. a) Explain the necessary terms used in polymer Drying with neat diagram. **8**

b) Explain in detail the term constant Rate Drying. **8**

OR

6. a) Discuss in brief the classification of polymer Dryers. **8**

b) Discuss in detail with neat diagram Drying of emulsion PVC Polymer. **8**

SECTION – II

7. a) Explain the scope of Chemical Kinetics. **6**

b) Discuss the classification of chemical reactions useful in reactor design. **6**

c) Discuss different parameters affecting Rate of reaction. **6**

OR

8. a) On doubling the concentration of reactant, the rate of reaction triples. Find the order of reaction. **6**

b) Explain Temperature Dependency equation of rate from Arrhenius equation. At 500 K the rate of bimolecular reaction is ten times the rate at 400 K. Find activation energy for this reaction 1) from Arrhenius law, 2) from Collision theory. **12**

9. a) Find the volume of Plug flow reactor for the reaction with rate equation $r_A = 85\ hr^{-1} * C_A$. Reaction is at 500° C and 5.5 atm giving 80% conversion for a feed of 2.5 kgmoles/hr. Assume fractional change in volume of the system = 0.75. **8**

b) Derive integrated rate equation for irreversible molecular n^{th} order, zero order, first order reaction in terms of concentration and conversion and half life period. What is meant by half life period ? **8**

OR

10. a) What is the performance equation for batch reactor for constant volume and variable volume reaction system ? **8**

b) Discuss the Integral Method of analysis of kinetics of Variable volume batch reactor for the irreversible first order and zero order reaction. **8**

11. a) What is the performance equation of PFR in series ? Compare the sizes of PFR and MFR for first order reaction in detail. **8 + 8**

OR

12. a) Write different factors to be considered while designing of polymer reactors. What are the advantages and disadvantages of batch reactor ? **16**

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Seat No.	

T.E. (Polymer) (Semester – I) Examination, 2014
POLYMER CHEMISTRY – I
(2008 Course)

Time : 3 Hours Max. Marks : 100

Instructions *: 1) Answer **any 3** questions from **each** Section.*
*2) Answers to the **two** Sections should be written in **separate** books.*
*3) **Neat** diagrams must be drawn **wherever** necessary.*
*4) Black figures to the **right** indicate **full** marks.*
*5) Your answers will be **valued** as a whole.*
*6) Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is **allowed**.*
*7) Assume suitable data, if **necessary**.*

SECTION – I

1. a) Discuss in detail the solution viscometric technique to determine number average M.W. in polymers. **8**

   b) How are polymers classified ? Discuss. **8**

   OR

2. a) Discuss any one method to determine weight average molecular weight in polymers. **8**

   b) What do you mean by polydispersity in case of polymers ? Differentiate between narrow and broad molecular weight distribution. **8**

3. a) Discuss the kinetics for cationic polymerisation. **9**

   b) Differentiate between bulk and solution polymerisation stating their advantages and disadvantages. **9**

   OR

4. a) Give a brief overview of solid and gas phase polymerisation. **9**

   b) Define the following. **9**
      i) Critical Micelle Concentration
      ii) Inhibitors
      iii) Chain Transfer Agents
      iv) Autoacceleration

5. a) Discuss the Nylon rope trick method for the preparation of Nylon 6,10. **8**

   b) Discuss the kinetics of catalysed and uncatalysed polyesterification reactions. **8**

   OR

P.T.O.

6. a) Comment on melt polymerisation technique giving examples. **8**

   b) With the help of reactions discuss polyaddition polymerisation. Give examples of polymers prepared by this method. **8**

SECTION – II

7. a) What do you mean by monomer reactivity ratios ? Discuss the following cases : **9**
   i) $r_1 = r_2 = 0$
   ii) $r_1 = r_2 = 1$ and
   iii) $r_1 < 1$ and $r_2 < 1$

   b) Discuss the different methods of synthesis of copolymers. **9**

OR

8. a) Define copolymerisation. Discuss the various types of copolymers with examples. **9**

   b) Write a short note on the "Alfrey price equation". **9**

9. a) Explain and differentiate between acidolysis, aminolysis and hydrolysis. **8**

   b) List the various factors which cause degradation in polymers. Discuss any one of them in detail. **8**

OR

10. a) Write a short note on addition and substitution reactions used for polymer modification. **8**

    b) Give the polymer modification reactions for any two specific functional groups. **8**

11. a) Write a short note on incineration of plastic waste. **8**

    b) Write any two modification reactions based on specific groups present in polymers. **8**

OR

12. a) Write a short note on recycling of plastics. **8**

    b) Discuss biodegradation in case of plastics. **8**

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Seat No.	

T.E. (Polymer) (Semester – I) Examination, 2014
(2008 Course)
POLYMER MATERIALS – I

Time : 3 Hours Max. Marks : 100

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

SECTION – I

1. a) Differentiate between commodity engineering and high performance polymers. Give two examples of each type. **8**

   b) Differentiate between polyvinylalcohol and polyvinylacetate w.r.t. structure and properties. **8**

OR

2. a) Discuss UHMHDPE with respect to properties, processing and applications. **8**

   b) State 3 copolymers of ethylene and give two properties of each. **8**

3. a) On the basis of composition differentiate between rigisols, plastisols and organosols w.r.t. PVC pastes. **9**

   b) Discuss any two of the following additives : **9**
      i) Antioxidants
      ii) Fillers
      iii) Heat stabilizers.

OR

4. a) Explain the steps involved in the manufacture of expanded polystyrene. **9**

   b) Discuss processing of PTFE. **9**

P.T.O.

5. a) How is acrylic cement and artificial dentures of PMMA prepared ? **8**

   b) Discuss compounding of cellulose acetate. **8**

OR

6. a) How is polycarbonate prepared ? Give two outstanding properties and two applications of polycarbonate. **8**

   b) Why is cellulose which is so abundantly found in nature not used as a polymer, but converted to cellulose acetate ? How is cellulose acetate prepared ? **8**

SECTION – II

7. a) State the different types of adhesives. Discuss any one. **9**

   b) What are the ingredients which go into making of a paint ? Give the role of each ingredient and also give one example of each ingredient. **9**

OR

8. a) What are the characteristics of a good solvent to be used with paints ? Give examples of a few solvents. **9**

   b) Discuss the following w.r.t. paints : **9**
      i) Antiskinning agents
      ii) Thickening agents
      iii) Dispersing agents.

9. a) What is the difference between raw rubber and a vulcanisate ? What is vulcanization and mastication w.r.t. rubbers ? **8**

   b) Discuss the characteristics of C-black as a filler. **8**

OR

10. a) Explain the process of vulcanization through a sketch of a rheograph indicating the process of transition during vulcanization. **8**

    b) Give an outline of latex technology. **8**

11. a) What are the advantages of thermoplastic elastomers over conventional rubbers and give a few areas of use of thermoplastic elastomers ? **8**

    b) Discuss the steps in the manufacture of ribbed smoked sheets in case of natural rubber. **8**

OR

12. a) Differentiate between oil-extended SBR, cold SBR and hot SBR. **8**

    b) Give structure and two applications each of the following rubbers. **8**
       i) SBR
       ii) IIR
       iii) Neoprene rubber.

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Seat No.	

T.E. (Polymer) (Semester – I) Examination, 2014
POLYMER STRUCTURE & PROPERTY RELATIONSHIP
(2008 Course)

Time : 3 Hours Max. Marks : 100

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

SECTION – I

1. a) Explain the reason for variation in density and melting point of LDPE, HDPE, and PP. **5**
   b) Explain the bonds carbon makes with other atoms and thus the effects. **8**
   c) Out of Nylon 6 and 66, which will absorb more moisture and why ? **5**

   OR

2. a) Write short note on how chemical composition affects following properties.
      1) Density 2) Flammability
      3) Melting point 4) Glass transition and
      5) Charring. **5**
   b) Give the role of amorphous and crystalline structure on mechanical properties with few egs. **5**
   c) List different types of additives used during compounding and its effect on polymer properties. **8**

3. a) Explain what is meant by M.W.D. and why is it important to be known ? How does MWD affect polymer properties ? **8**
   b) For same M.W, put the following 3 polymers in increasing order of their density and explain the reason behind their densities. **4**
   c) Give the effect of plasticizer on modulus as well as processability. **4**

   OR

4. a) Give the effect of M.W. on ESCR, impact strength, tensile strength and % elongation. **6**
   b) What is meant by 1^{st} order and 2^{nd} order transition and explain the effect of M.W on Tg. **6**
   c) During blow molding, what type of M.W. and M.W.D. are required and why ? **4**

P.T.O.

5. a) What are the factors that affect flexibility in polymer backbone chains ? **8**
   b) Explain fringed micelle model along with spherulite and factors affecting their growth. **8**

OR

6. a) What are the chemical groups that influence adhesion ? Explain the adhesion mechanism. **8**
   b) Give the effect of molecular flexibility on properties like Tg, Tm and crystallization. **8**

SECTION — II

7. a) Explain what make a polymer amorphous or semicrystalline. Give examples. Also can one say that semicrystallinse polymers have better mechanical strength than amorphous polymers. Justify. **6**
   b) Why Nylons have high M.P. and density than polyolefins ? **6**
   c) Out of PS and LDPE, explain which one will have higher modulus and why ? **6**

OR

8. a) Give factors leading to crystallinity and its effect on various properties like processing, mechanical, thermal etc. **9**
   b) Explain the similarity and differences between crystallinity and orientation. **9**

9. a) What are Intermolecular bonding forces ? Explain induced and permanent Dipole and effect of these forces on structure and properties like solubility, melting, CED, permeability etc. **8**
   b) Explain role of Cohesive Energy Density and method used to find CED. **8**

OR

10. a) Explain London Dispersion Forces and factors affecting them. **8**
    b) Give the effect of cross linking and polarity on polymer properties like mechanical, chemical, thermal, electrical, optical etc. **8**

11. a) What are the different types of foams ? Explain in detail. **8**
    b) Explain how size and shape of product influences the properties obtained from same polymer with few egs. **8**

OR

12. a) Explain the significance of temporary heterogeneity required for processing. **8**
    b) What are plastisols ? Give few of its applications. **4**
    c) Write a note on membranes. **4**

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Seat No.	

T.E. (Polymer) (Semester – I) Examination, 2014
DESIGN OF EQUIPMENT AND MACHINE ELEMENTS
(2008 Course)

Time : 3 Hours Max. Marks : 100

Instructions : *1) Answers to the **two** Sections should be written in **separate** answer books.*
*2) Neat diagrams must be drawn **wherever** necessary.*
*3) Figures to the **right** side indicate **full** marks.*
*4) Use of calculator is **allowed**.*
*5) Assume suitable data if **necessary**.*

SECTION – I

1. a) Write in short about **any 2 :** **6**
   i) Types of sunk keys
   ii) Maximum principal stress theory
   iii) Copper alloys

   b) Draw Mohr's circle and show principal stresses for the following stress condition
   σ_x = 100 MPa, σ_y = 20 MPa, τ_{xy} = 60 MPa. Also calculate maximum shear stress. **6**

   c) Explain muff coupling with a neat figure. **6**

   OR

2. a) Design a bush pin type flexible coupling to connect a pump shaft transmitting 40 kW at 1100 rpm. The overall torque is 25% more than mean torque. The material properties are as follows : **18**
   i) allowable shear and crushing stress for shaft and key material is 40 MPa and 80 MPa respectively. Draw a neat sketch
   ii) allowable shear stress for cast iron is 15 MPa
   iii) allowable bearing pressure for rubber bush is 0.8 N/mm^2
   iv) the material of pin is same as that of the shaft.

3. a) A shaft of mild steel is required to transmit 140 KW at 300 rpm. The supported length of the shaft is 2.5 m. It carries two pulleys each weighing 1200 N at a distance of 0.9 m from the ends respectively. Taking allowable shear stress as 60 N/mm^2, determine shaft diameter. Pulleys transmit power in the vertically downwards direction. **10**

   b) Derive an expression for a solid shaft subjected to (i) twisting moment T only and bending moment M only. **6**

   OR

P.T.O.

4. a) Two V belts in parallel transmit power through grooved pulleys of the same size. Calculate power that can be transmitted between the pulleys. Given : **10**
   1) Angle of groove: 30°
   2) Cross-sectional area of each belt : 1000 mm^2
   3) Coefficient of friction: 0.15
   4) Density of the belt material: 1200 kg/cm^2
   5) Pulley diameter = 300 mm,
   6) 1000 rpm
   7) Maximum safe stress in belt material: 8 MPa.

   b) Write a note on design of shaft based on torsional rigidity and lateral rigidity. **6**

5. a) Write a note on commonly used materials for making of bearings. **6**

   b) Explain the terms Sommerfield number and bearing characteristic number. **6**

   c) Write a short note on Norton gear drive. **4**

OR

6. a) Write stepwise procedure for design of journal bearings. **8**

   b) Calculate basic dynamic load rating for a self aligning ball bearing for radial load of 6000 N and thrust load of 2000 N. The desired life of bearing is 150 millions of revolution at 300 rpm. Assume uniform and steady load. Take radial factor (X) and thrust factor (Y) as 0.65 and 3.5 respectively. **8**

SECTION – II

7. a) Draw hydraulic circuits for following operations and explain the functioning of the circuit **(any three) :** **12**
   1) Traverse and feed circuit
   2) Meter-in, Meter-out and bleed-out type speed control
   3) Regenerative circuit
   4) Basic hydraulic rotary motion circuit.

   b) Draw a neat sketch of any one type of flow control valve and explain the functioning of the same. **6**

OR

8. a) Draw neat sketch of any one type of hydro-motor and explain the functioning of the same. **6**

   b) Write a short note on different types of directional control valves. **6**

   c) Explain the functioning of axial piston type of pump with a neat sketch. **6**

9. a) Draw and explain a circuit showing back pressure control during plasticizing operation of injection moulding hydraulic circuit. **6**

   b) Explain the function of accumulator in injection moulding hydraulic circuit and also explain the use of accumulator in thin walled moulding. **3**

   c) Draw hydraulic circuit showing injection and hold on operations and explain the functioning of the circuit. **7**

OR

10. a) Explain the accumulator charging and discharging hydraulic circuit. **4**

    b) Explain why intensifier is used in tonnage built up operation in case of injection moulding machines. Draw a circuit showing only tonnage built up and explain the functioning of the same. **6**

    c) Explain the merits of toggle type machines over direct locking hydraulic machines. **6**

11. a) A cylindrical pressure vessel 2 m in diameter is to operate at a pressure of 5 kg/cm^2. The permissible stress in the material is 900 kg/m^2. Welded joint efficiency is 90%. Calculate the thickness required for the vessel if the vessel is to be fabricated in spherical form. What maximum pressure will it be able to withstand ? **8**

    b) Write short notes on :
    i) pressure vessel flange
    ii) pressure vessel with half coil jacket. **8**

OR

12. a) A cylindrical pressure vessel 2 m in diameter and 5 m in height is subjected to an internal pressure of 7kg/cm^2. Corrosion allowance is 1.5 mm. If the vessel is fabricated as (i) Class B vessel with j = 0.85 (ii) Class C vessel with J = 0.5 and 0.7. If a strip of suitable size is welded along the longitudinal joint (J = 0.1), what will be the thickness of the vessel ? What will be the percentage saving in the material ? **8**

    b) Write short note on (i) material of construction for pressure vessel (ii) supports for pressure vessel with half coil jacket. **8**

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Seat No.	

T.E. (Computer) (Semester – I) Examination, 2014
DATA COMMUNICATIONS
(2008 Course)

Time : 3 Hours Max. Marks : 100

SECTION – I

1. a) What is Communication System ? With neat diagram explain the Simplified Communication System. **6**

   b) What is SNR ? Explain in detail. We have a channel with 5 KHz bandwidth if we want to send data at 150 kbps, what is minimum SNR_{dB} and SNR ? **6**

   c) Differentiate between analog and digital signals. Explain any two analog modulation techniques. **6**

   OR

2. a) Distinguish between multilevel TDM, multiple slot TDM and Pulse-stuffed TDM. **6**

   b) Which of the three multiplexing techniques is common for fiber optic links ? Explain the reason. **6**

   c) An analog signal has a bit rate of 8000 bps and a baud rate of 1000 baud. How many data elements are carried by each signal element ? How many signal element do we need ? **6**

3. a) State and explain Sampling Theorem. What is aliasing ? When does it occur ? **8**

   b) Distinguish between forward error correction versus error correction by retransmission. **8**

   OR

4. a) Explain following line coading techniques with example i) NRZ-L ii) NRZ-I iii) RZ iv) Manchester. **8**

   b) Explain stop-and -wait ARQ Protocol. State its limitation and compare it with Go-Back-N ARQ Protocol. **8**

5. a) Discuss the concept of redundancy in error detection and correction. **8**

   b) With neat diagram explain the working of Selective Repeat Protocol. State its applications. **8**

   OR

6. a) Write a short note on Channel througput and efficiency. Explain Shannon's theorem on channel capacity. **8**

   b) Explain Hamming code as error correcting code. What is minimum Hamming distance and Hamming weight of code word ? **8**

P.T.O.

SECTION – II

7. Write short note on (**any three**). **18**
   i) Network topology
   ii) SONET
   iii) ATM adaption layer
   iv) DSL classification.

OR

8. a) Explain the architecture of Bluetooth protocol with neat diagram. State the applications and limitations of Bluetooth. **10**
   b) Draw and explain the MAC sublayer frame format of standard ethernet. **8**
9. a) What is wireless media ? Describe the classification. **8**
   b) What is TSI ? Describe its role in Time Division Switching. Compare space division and time division switches. **8**

OR

10. a) What is Frequency hopping ? Explain the types of frequency hopping. **8**
   b) Give a brief description of following :
      i) Co-axial cable
      ii) Twisted pair cable
      iii) Fiber optic cable

   List the advantages of fiber optic cables. **8**
11. a) Write short note on persistent and non persistent CSMA. **8**
   b) What is channel allocation ? Describe in brief the channel allocation methods. **8**

OR

12. a) What is HDLC ? Draw and explain the frame types of HDLC. **8**
   b) Explain random access protocol. Why collision is an issue in random access protocol as opposed to controlled access protocols ? Justify. **8**

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Seat No.	

T.E. (Computer) (Semester – I) Examination, 2014
MICROPROCESSORS AND MICROCONTROLLERS
(2008 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) Answer to the two Sections should be written in two **separate** books.*
*4) **Neat** diagrams must draw **wherever** necessary.*
*5) Figures to the **right** indicate **full** marks.*
*6) Assume suitable data if **necessary**.*

SECTION – I

1. a) With the help of neat diagram explain architecture of Pentium processor. **8**
   b) Write architectural differences between 80286 and 80386 of Intel processors. **8**

OR

2. a) Explain Branch Prediction in Pentium with diagram. **8**
   b) Which features makes Pentium, a superscalar processor ? Explain in detail. **8**
3. a) Explain with the help of timing diagram the memory read and write operations in Pipelined bus cycles. **8**
   b) Describe following addressing modes of Pentium with suitable examples. **8**
      1) Immediate addressing mode
      2) Direct addressing mode
      3) Register indirect addressing mode
      4) String addressing mode.

OR

4. a) What do you mean by bus cycle ? Discuss the various control signals required for I/O Read and write cycle. **8**
   b) What is the purpose of control registers ? Explain significance of these registers in working if cache and paging unit. **8**
5. a) Draw a segment descriptor format. Discuss various protection mechanisms provided to access segment in Pentium. **10**
   b) Define a selector. Draw and explain its structure. **8**

OR

P.T.O.

6. a) What is a linear address ? Explain the mapping of linear address to physical address with an appropriate data structure. **10**

   b) How does TLB increase the performance of paging mechanism in Pentium ? **8**

SECTION – II

7. A) How interrupts are handled in protected mode ? Explain with the help of neat diagram. **8**

   B) What are the different ways to enter into virtual mode ? **6**

   C) Compare real mode, protected mode and virtual mode. **4**

OR

8. A) Differentiate between interrupt handling in real mode and protected mode of Pentium in detail. **10**

   B) What is IDT ? Explain various mechanisms to handle interrupt in Pentium. **8**

9. A) Explain 8051 microcontroller's External memory and I/O addressing modes. **8**

   B) Explain General Purpose (Working Registers) and special function registers in 8051. **8**

OR

10. A) Draw the memory map of 8051 microcontroller. Show the bit addressable Internal RAM area. **8**

    B) What are different addressing modes in 8051 ? Explain with suitable examples. **8**

11. A) What are the various SFR you need while programming a serial port ? Explain in detail. **8**

    B) Describe different Timer modes of 8051 Microcontroller. **8**

OR

12. A) Describe serial port on 8051 with the help of SCON. **8**

    B) Draw and explain Program Status word of 8051 Microcontroller. **8**

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Seat No.	

T.E. (Biotechnology) (Semester – I) Examination, 2014
GENETICS ENGINEERING
(2008 Pattern)

Time : 3 Hours Max. Marks : 100

Instructions *: 1) Answer **3** questions from **each** Section.*
*2) Answers to the **two** Sections should be written in **separate** answer books.*
*3) Figures to the **right** indicate **full** marks.*
*4) **Neat** diagrams must be drawn **whenever** necessary.*

SECTION – I

1. Explain briefly different types of restriction enzymes and their mode of action. Add a note on DNA modifying enzymes. **18**

OR

2. With the help of neat labeled diagram explain polymerase chain reaction. Add a note on PCR optimization. **18**

3. What are vectors ? Explain in detail the vectors for cloning in eukaryotic cells. **16**

OR

4. Discuss the following (**8** marks **each**) : **16**
   a) Selection of blue white colonies.
   b) Role of RTPCR in studying protein expression profile of an organism.

5. Explain briefly : **16**
   a) Bacterial artificial chromosomes
   b) Yeast artificial chromosomes.

OR

6. Discuss the following (**8** marks **each**) : **16**
   a) Concept of cDNA libraries.
   b) Amplification of gene libraries.

SECTION – II

7. Answer the following techniques in detail : **16**
   a) Gene isolation
   b) DNA sequencing.

OR

P.T.O.

8. Answer the following (**8** marks **each**) : **16**
   a) PCR cloning
   b) Synthesis of artificial DNA.
9. Write short notes on (**9** marks **each**) : **18**
   a) Transgenic plants and their application.
   b) Role of genetic engineering in the production of recombinant protein.

OR

10. Describe transformation, transinfection and translocation in detail. Add a note on transgenic animals. **18**
11. What are vaccines ? Explain in detail with examples live vaccines and recombinant vaccines. **16**

OR

12. Write short notes on (**4** marks **each**) : **16**
    a) AFLP
    b) Humulin
    c) Golden rice
    d) Conjugation.

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Seat No.	

T.E. (Biotechnology) (Semester – I) Examination, 2014
FERMENTATION TECHNOLOGY – I
(2008 Course)

Time : 3 Hours Max. Marks : 100

N.B. : *i) Answer **three** questions from Section **I** and **three** questions from Section **II.***
*ii) Answers to the **two** Sections should be written in **separate** answer books.*
*iii) Neat diagrams must be drawn **wherever** necessary.*
*iv) Figures to the **right** indicate **full** marks.*
*v) Assume suitable data, if **necessary.***

SECTION – I

1. How is preservation of industrially important microbes carried out ? Write in detail about inoculum preparation. **16**

OR

2. Draw a neat labelled growth curve. Explain each growth phase and enlist fermentation products linked to each phase. Write Monod growth kinetics for bacterial as well as fungal cells. **16**

3. Why sterilization is important in fermentation technology ? Discuss different methods of sterilization and their mechanism of destructions. **16**

OR

4. What is the importance of medium optimisation in fermentation technology ? Explain any one method of media optimisation. **16**

5. Which medium component affects most on production of citric acid ? Explain the effect with metabolic pathway of citric acid production. Describe the general production process of citric acid in detail. **18**

OR

6. Describe in detail production of following alcoholic beverages. **18**
   a) Wine b) Beer

P.T.O.

SECTION – II

7. What is the mechanism of action of following antibiotics ? Explain each in brief : **16**
   a) Streptomycin
   b) Penicillin
   c) Tetracycline
   d) Chloromycetin

OR

8. Explain in detail production, isolation and use of any two microbial enzymes. **16**

9. Explain SSF and SLF in detail. What are the advantages and disadvantages of SSF and SLF ? **18**

OR

10. State and briefly explain different types of bioreactors. Draw neat labeled diagram of CSTR. Explain the parts and their functions of bioreactor in detail. **18**

11. What is Scale Up ? Explain the concept with following points : **16**
   a) Principles
   b) Theoretical considerations
   c) Techniques used

OR

12. Write in detail about fermentation economics with one example. **16**

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Seat No.	

T.E. (Biotechnology) (Semester – I) Examination, 2014
HEAT TRANSFER
(2008 Course)

Time : 3 Hours | Max. Marks : 100

***Instructions** : 1) Answers to the **two** Sections should be written in **separate** answer books.*
*2) Answer Q. **1** or **2** , Q. **3** or **4**, Q. **5** or **6** from Section **I** and Q. **7** or **8**, Q. **9** or **10**, Q. **11** or **12** from Section **II**.*
*3) **Neat** diagrams must be drawn **wherever** necessary.*
*4) Figures to the **right** side indicate **full** marks.*
*5) Use of Calculator is **allowed**.*
*6) Assume suitable data if **necessary**.*

SECTION – I

1. a) Explain In detail " Modes of Heat Transfer". **6**
   b) What are different applications of Dimensional Analysis ? **6**
   c) Explain with one example the term "Thermal Resistance". **6**

OR

2. a) State and explain the following : **12**
      i) Fourier's law of conduction
      ii) Newton's law of cooling
      iii) Stefan-Boltzmann law of cooling.
   b) Explain Rayleigh's method of dimensional analysis. **6**

3. a) Derive the heat flow equation for steady state heat conduction through composite plane wall. **9**
   b) Calculate the critical radius of insulation for asbestos (K = 0.172 W/mk) surrounding a pipe and exposed to room air at 300 K with h = 2.8 W/m^2k. Calculate the heat loss from 475 K, 60 mm diameter pipe when covered with the critical radius of insulation and without insulation. **7**

OR

4. a) Write short notes on : **4**
      i) Critical thickness
      ii) Optimum thickness of insulation

P.T.O.

4. b) A Furnace wall made up of steel plate of 1 cm thick is lined on inside with silica brick 15 cm thick and on the outside with magnesite brick 15 cm thick. The temperature on the inside surface of the wall (i.e. surface of silica brick) is 700° C and on the outside (i.e. surface of the magnesite brick) of the wall is 15° C. Find out quantity of heat passed in Kcal/m^2 hr and temperature at the interface between the steel plate and the magnesite brick. It is required to reduce the heat flow to 1000 Kcal/m^2 hr by means of air gap between steel plate and magnesite brick. Estimate the width of this gap. Use the following data : **12**

K of steel = 14.5 K cal/m hr° C

K of silica brick = 1.4 Kcal/m hr° C

K of magnesite brick = 4.5 Kcal/m hr° C

K of air = 0.029 Kcal/m hr° C

5. a) Write a note on heat transfer by Forced Convection. **6**

b) Water at 20° C enters a 2 cm diameter tube with a velocity of 1.5 m/s. The tube is maintained at 100° C. Find the tube length required to heat water to a temperature of 60° C. **10**

Given : T_1 = 20° C T_2 = 60° C V = 1.5 m/s

Properties of water at 40° C are :

Pr = 4.31

ρ = 992.2 kg/m^3

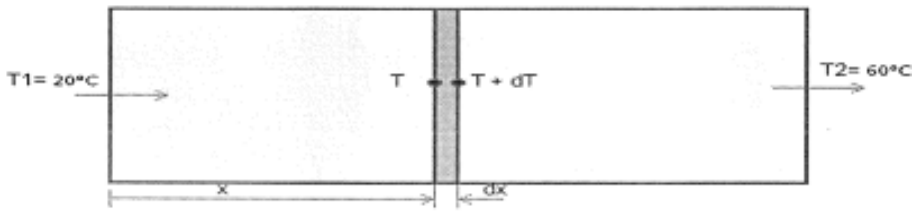
Cp = 4174 J/kg K

K = 0.634 W/m K

v = 0.659 x 10^{-6} m^2/s

Find : Tube length, L

Schematic :



OR

6. a) Discuss in detail Stefan-Boltzmann law and Planck's law. **10**

   b) Write short notes on : **6**
      i) Types of convection
      ii) Thermal boundary layer.

SECTION – II

7. a) Discuss the following terms : **8**
      i) Emissivity
      ii) Radiosity
      iii) Shape factor
      iv) Gray body.

   b) Explain about Kirchoff's law and planck's law in detail. **8**

OR

8. a) A 48 mm internal diameter iron pipe at 423° K passes through a room in which the surroundings are at temperature of 300° K. If the emissivity of the pipe metal is 0.8, what is the net interchange of radiation energy per meter length of pipe ? The outside diameter of pipe is 60 mm. **8**

   b) What is Wien's law of displacement ? Derive the expression. **8**

9. a) Define the effectiveness and NTU of heat exchanger. Derive the relation between them for parallel flow heat exchanger. **8**

   b) Explain heat exchanger analysis with the use of log mean temperature difference method. **8**

OR

10. a) Explain the concept of Fouling. Discuss any four parameters which affect Fouling. **8**

    b) Explain the classification of evaporators. Explain agitated film evaporator in detail. **8**

11. a) Write a short note on shell and tube heat exchangers. **9**

    b) Write short notes on **9**
       i) Multiple effect evaporator
       ii) Calendria type of evaporator.

OR

12. a) An evaporator operating at atmospheric pressure (101.325 Kpa) is fed at the rate of 10,000 Kg/hr of weak liquor containing 4% caustic soda. Thick liquor leaving the evaporator contains 25% caustic soda. Find the Capacity of the evaporator. **9**

    b) Give comparison of forward feed and backward feed arrangement in the multiple effect evaporation system. **9**

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Seat No.	

T.E. (Semester – I) (Biotechnology) Examination, 2014
COMPUTATIONAL TECHNIQUES AND BIOSTATISTICS
(2008 Course)

Time : 3 Hours Max. Marks : 100

Instructions *: 1) Answers to the **two** Sections should be written in separate answer books.*
*2) Answer Q. **1** or Q. **2**, Q. **3** or Q. **4**, Q. **5** or **6** from Section **I** and Q. **7** or Q. **8**, Q. **9** or **10**, Q. **11** or **12** from Section **II**.*
*3) **Neat** diagrams must be drawn **wherever** necessary.*
*4) Figures to the **right** side indicate full marks.*
*5) **Use** of Calculator is **allowed**.*
*6) Assume suitable data if **necessary**.*

SECTION – I

1. a) Fit a second degree parabola to the following data : **8**

x	0	1	2	3	4
y	1	1.8	1.3	2.5	6.3

b) Fit a straight line of the form $y = a + bx$ by the method of least squares. Calculate y when b is 150. **8**

x	50	70	100	120
y	12	15	21	25

OR

2. a) Fit an exponential curve $y = ax^b$ to the following data. **8**

x	1	2	3	4	5
y	0.5	2	4.5	8	12.5

b) Fit a parabola $y = a + bx + cx^2$ to the following data. **8**

x	2	4	6	8	10
y	3.07	12.85	31.47	57.38	91.29

3. a) i) Evaluate $\Delta\ (e^x \log 2x)$ **10**

ii) Evaluate $\Delta^2 \cos 2x$.

b) Express $y = 2x^3 - 3x^2 + 3x - 10$ in a factorial notation and prove that $\Delta^3 y = 12$. **6**

OR

4. a) Define the following terms : **8**
   i) Interpolation and Extrapolation
   ii) Forward difference operator
   iii) Argument and Entry
   iv) Leading term and leading differences.

P.T.O.

b) State Newton's interpolation formula and use it to calculate the value of exp(1.85) given the following table. **8**

x	1.7	1.8	1.9	2.0	2.1	2.2	2.3
f(x)	5.474	6.050	6.686	7.389	8.166	9.025	9.974

5. Use the following rules for finding the value of $\int x^3$ between the limits 0 to 1 by considering five sub intervals. **18**
   a) Simpson's rule
   b) Trapezoidal rule.

OR

6. A rocket is launched from the ground. Its acceleration is registered during the first 80 seconds and is given in the table. Using Simpson's rule and Trapezoidal rule find the velocity of the rocket at t = 80 seconds. **18**

t(sec)	0	10	20	30	40	50	60	70	80
f(cm/sec^2)	30	31.63	33.34	35.47	37.75	40.33	43.25	46.69	50.67

SECTION – II

7. a) Using Bisection method find a root of the equation $x^3 - 5x + 1 = 0$. **8**
   b) Using the method of Newton Raphson find the root of 1/31 correct to four decimal places. **8**

OR

8. Develop a recurrence formula for finding cube root of N and hence find the root of cube root of 41 by Newton Raphson method. **16**
9. Write short notes on various types of Circle diagrams. List out the limitations of a Pie diagram. **16**

OR

10. Write short notes on Sampling errors. Explain the causes of bias while sampling. **16**
11. Define Geometric mean. Give its formula. What are the properties of Geometric mean ? What are its uses ? In a moderately asymmetrical distribution the mode and mean are 32.1 and 35.4 respectively. Find out the value of median. **18**

OR

12. In a cross breeding experiment with plants of certain species 240 off springs were classified into 4 classes with respect to the structure of their leaves as follows : **18**

Class :	I	II	III	IV	Total
Frequency :	21	127	40	52	240

According to the theory of heredity the probabilities of the four classes should be in the ratio 1 : 9 : 3 : 3. Are these data consistent with theory ? Use 5%, value of Chi square for 3 degrees of freedom = 7.82.

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Seat No.	

T.E. (Mechanical Sandwich) (Semester – I) Examination, 2014
PRODUCTION MANAGEMENT
Self Study
(2008 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** 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 Production Management. State various activities involved in it. **8**
   b) What do you understand by Organization ? Explain various types of Organizations. **8**

OR

2. a) What are various responsibilities of Production Manager ? What qualities are required in a good production manager ? Explain. **8**
   b) Describe various forms of business ownership. Explain salient features of each. **8**

3. a) What are different components of production function ? Describe them briefly. **8**
   b) Define and explain industrial engineering. What is its importance ? **8**

OR

4. a) Describe various types of production. Explain characteristics of each. **8**
   b) What do you understand by facilities planning ? Explain importance of it. **8**

5. a) Define method study. What are its objectives ? Explain. **8**
   b) Explain various steps involved in time study. **5**
   c) Explain concept of questioning technique in method study. **5**

OR

6. Write short note on the following **(any three)** : **18**
   1) Computation of standard time.
   2) SIMO chart.
   3) Selection of site.
   4) MTM1.
   5) Importance of ergonomics in industry.

SECTION – II

7. a) Explain meaning of "Quality". Why is it important to maintain quality ? **8**
   b) What is acceptance sampling ? Under what conditions is acceptance sampling preferred over cent percent inspection ? **8**

OR

8. a) What are control charts ? How are they made and used in controlling a process ? Explain. **8**
   b) What do you understand from Acceptance Quality Level (AQL) ? What is its significance ? Explain. **8**

9. a) What are quality circles ? What are benefits that organization cans achieve through it ? Explain. **8**
   b) What do you understand by 5' S techniques ? Is it a effective management tool ? Justify. **8**

OR

10. a) What does Just-in-time (JIT) signify ? How far is JIT concept possible to be applied in Indian conditions ? Explain. **8**
    b) Discuss briefly the technique of Kaizen. **8**

11. a) Explain Deming's approach towards quality and world class manufacturing. **8**
    b) Describe concept of Six Sigma. **10**

OR

12. Write short note on the following **(any three)** : **18**
    1) Total Quality Management
    2) Poka Yoke
    3) ISO
    4) FEMA
    5) PDCA.

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Seat No.	

T.E. (Civil) (Semester – I) Examination, 2014
FLUID MECHANICS – II
(2008 Course)

Time : 3 Hours Max. Marks : 100

***Instructions** : i) Answer Q.**1** or Q.**2**, Q.**3** or Q.**4**, Q.**5** or Q.**6** in Section **I**.*
*ii) Answer Q.**7** or Q.**8**, Q.**9** or Q.**10**, Q.**11** or Q.**12** in Section **II**.*
*iii) Answer to the **two** Sections should be written in **separate** answer booklet.*
*iv) **Neat** diagrams must be drawn **wherever** necessary.*
*v) Black figure to the **right** indicate **full** marks.*
*vi) Your answer will be valued as a **whole**.*
*vii) **Use** of electronic pocket calculator is **allowed**.*
*viii) Assume suitable data **if necessary**.*

SECTION – I

1. a) A cylinder 20 cm in diameter and 10 m long is made to turn 1200 revolutions per minute with its axis perpendicular in a stream of air having uniform velocity of 20 m/s. Find (a) the circulation (b) the lift force experienced by the cylinder and (c) the position of stagnation points. Take density of air as 1.22 kg/m^3. **8**

   b) Derive an expression for the effective bulk modulus of elasticity of fluid taking into account the elasticity of the pipe material. **8**

OR

2. a) Distinguish clearly between (i) Skin friction drag and form drag (ii) Profile drag and deformation drag. **4**

   b) What is Magnus effect ? Write the Kutta-Joukowski equation stating meaning of each symbol. **4**

   c) A tank has an upper cylindrical portion of 1.25 m radius and 3 m height with hemispherical base. The tank is provided with an orifice of 150 mm diameter at its bottom. Find the time required to empty it if it is initially full of water. Take C_d = 0.62 for the orifice. **8**

3. a) Show that the theoretical efficiency of a water wheel having equispaced symmetrical semi-circular curved vanes fixed radially on its periphery can be as maximum as 100% when the jet of water strikes the vane normally at their centers. **8**

   b) A centrifugal pump delivers water against a head of 20 m. The external and internal diameters of the impeller are 400 mm and 200 mm respectively. Find the minimum starting speed of the pump. **8**

OR

P.T.O.

4. a) Define specific speed of centrifugal pump. Derive equation for it. **8**

   b) A 40 m/sec velocity jet of water strikes without shock a series of vanes moving at 10 m/sec. The jet is inclined at an angle of 20° to the direction of motion of vanes. The relative velocity of jet at outlet is 0.9 times the value at inlet and the absolute velocity of water at exit is to be normal to the motion of vanes. Determine i) Vane angle at entrance and exit ii) Work done on vanes per second per N of water supplied by the jet iii) The hydraulic efficiency. **8**

5. a) A model turbine is constructed with a scale of 1 : 25. The turbine develops 6800 kW power under a head of 5 m when running at 100 r.p.m. The efficiency of turbine is 92%. If the head available in the laboratory is 4.3 m for the model, determine specific speed, speed discharge and power developed. **8**

   b) For a typical hydroelectric power plant, indicate different components in a neat sketch. Also state the functions of each component. **10**

OR

6. a) In a hydroelectric generating plant, there are 4 similar turbines of total output 360 MW. Each turbine is 85% efficient and runs at 120 r.p.m. under a head of 70 m. It is proposed to test the model of the above turbines in a flume where discharge is 400 lit/sec under a head of 4 m. Work out the scale ratio of the model. Also calculate the model speed and power results expected from the model. **8**

   b) For a reaction turbine, explain the hydraulic functions of wicket gates and draft tube. **4**

   c) For a turbine, define and derive 'specific speed'. **6**

SECTION – II

7. a) Derive the conditions for most economical trapezoidal channel section. **8**

   b) Determine the dimensions of the most economical rectangular channel section to carry discharge of 2 m^3/s at a slope of 0.0001. Take Manning's n = 0.016. **8**

OR

8. a) Differentiate between pipe flow and open channel flow. **4**

   b) Write a short note on velocity distribution in open channel flow. **4**

   c) Determine the dimensions of the most economical trapezoidal channel section to pass a discharge of 15 m^3/s at a bed slope of 1 in 2500 and side slope of 1 : 1. Take Manning's n = 0.020. **8**

9. a) Derive the condition for maximum discharge at a given specific energy in a rectangular channel. **6**

   b) Define hydraulic jump. State different uses of hydraulic jump. **6**

   c) A hydraulic jump occurs in a rectangular channel. The depth of flow and Froude number upstream of a jump are 0.5 m and 9 respectively. Calculate the energy loss in the jump and the length of the jump. **6**

OR

10. a) Derive the formula for sequent depth ratio. **9**

b) A 4 m wide rectangular channel carries 11.5 m^3/s of water with a depth of 2 m. At a section in this channel, the width is reduced to 3 m and also a hump of 0.25 m is provided. How much will be the difference in the water levels on upstream and at the hump ? **9**

11. a) Classify the channel bottom slopes and discuss in detail M2 profile. **8**

b) A 10 m wide rectangular channel carries a discharge of 30 m^3/s with a bed slope of 1 in 10000. At a section the depth of flow is 3.1 m. How far upstream or downstream of this section, the depth will be 3 m. Take n = 0.015. Use step method and take only one step. Also sketch the profile. **8**

OR

12. a) What is GVF ? Derive the dynamic equation of GVF. **8**

b) What is a control section ? Give its significance. State different types of control sections. **8**

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Seat No.	

T.E. (Production Engg.) (Semester – I) Examination, 2014
KINEMATICS OF MANUFACTURING MACHINES
(2008 Course)

Time : 4 Hours Max. Marks : 100

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

SECTION – I

1. a) Explain various kinematics principles used in the operation of gear hobbing machine used to generate helical gear. **8**
   b) Derive an expression for displacement, velocity and acceleration analysis of slider crank mechanism. **10**

OR

2. a) Discuss type synthesis, number synthesis and dimensional synthesis. **8**
   b) A four bar mechanism is to be designed by using three position points, to generate the function, $y = x^{1.3}$ for the range $2 \leq x \leq 5$. Assuming 40° starting position and 120° finishing position for the input link and 90° starting position and 180° finishing position of the output link, find the values of x, y, θ and ϕ corresponding to three position points. **10**
3. a) Explain velocity of sliding of a spur gear. **6**
   b) A two stage epicyclic gear train is shown in Fig. 1. The input shaft P is connected to sun wheels S_1 (40 teeth) and S_2 (20 teeth), and the output shaft Q attached to carrier for P_2. A_1 has 80 teeth and A_2 which forms the carrier for P_1 has 100 teeth. Find the gear ratio when
   i) A_1 is fixed, ii) A_2 is fixed **10**

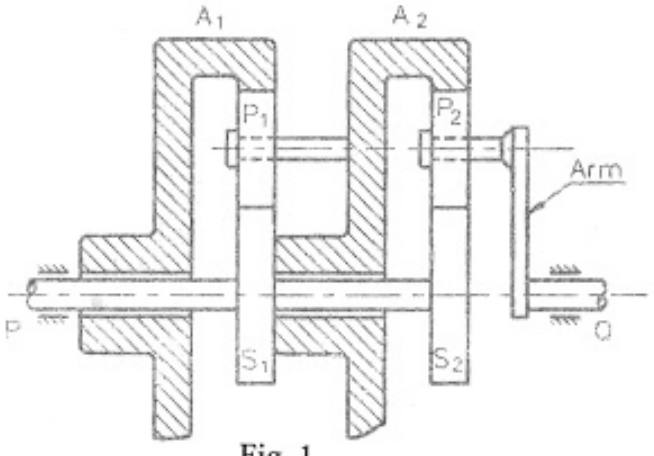

Fig. 1

OR

4. a) Explain how cycloidal gear tooth profile satisfy the law of gearing. **6**

   b) Two mating gears have 20° involute teeth, the number of teeth on pinion is 24 and on gear wheel is 48. The speed of pinion is 300 r.p.m. The module is 6 mm. If the addendum on each gear is such that the path of approach and the path of recess are half, their maximum possible values find :
      i) The addendum on gears
      ii) The length of arc of contact
      iii) The maximum velocity of sliding gears
      iv) The contact ratio. **10**

5. a) Explain energy stored in a flywheel. **6**

   b) A punching press is to be driven by constant torque electric motor. A pressure is provided by a flywheel that rotates at a maximum speed of 225 r.p.m. Radius of gyration of flywheel rim is 0.5 m. Press punches 720 holes per hour. Each operation takes 2 seconds and requires 15 KN-m of energy. Find the power of the motor and the minimum mass of the flywheel if speed of the flywheel not to fall below 200 rpm. **10**

OR

6. a) Derive the expression for the following : **6**
      i) Coefficient of fluctuation of speed.
      ii) Maximum fluctuation of energy.

   b) A single cylinder double acting stem engine develops 150 kW at a mean speed of 80 r.p.m. The coefficient of fluctuation of energy is 0.1 and the fluctuation of speed is $\pm$ 2% of mean speed. If the mean diameter of the flywheel rim is 2m and the hub and spokes provide 5% of the rotational inertia of the wheel, find the mass of the flywheel and the cross sectional area of the rim. Assume the density of the flywheel material (Cast iron) as 7200 kg/m^3. **10**

SECTION – II

7. a) With neat sketch explain the classification of followers based on line of motion. **6**

   b) Draw the profile of a disc cam to give uniform motion during outstroke of 25 mm to a knife edge follower during the first half of the cam revolution. The return of the cam also takes place with uniform motion during the another half of cam revolution. Minimum radius of the cam is 25 mm. Draw the shaft on which cam is mounted showing the position of the key. Shaft diameter = 25 mm. The axis of the knife edge follower passes through the axis of the cam. **12**

OR

8. a) With neat sketch explain the classification of cams based on follower motion. **6**

   b) It is required to set out the profile of a cam to give the following motion to the reciprocating follower with a flat mushroom contact face :
      i) follower to have a stroke of 20 mm during 120° of cam rotation;

ii) follower to dwell for 30° of cam rotation;
iii) follower to return to its initial position during 1200 of cam rotation;
iv) follower to dwell for remaining 90° of cam rotation.

the minimum radius of cam = 25 mm. Outstroke and return stroke of the follower are performed with simple harmonic motion. **12**

9. a) Explain any two effects of partial balancing in locomotives. **8**

b) A four cylinder marine engine has the cranks arranged at angular travels of 90°. The inner cranks are 1.2 m apart and are placed symmetrically between the outer cranks which are 3 m apart. Each crank is 45 cm long. The engine runs at 90 r.p.m. and mass of reciprocating parts of each cylinder is 900 kg. In which order should the cranks be arranged for the balance of reciprocating parts and what shall be the magnitude of the unbalanced primary couple ? **8**

OR

10. a) Explain direct and reverse cranks method. **8**

b) An coupled locomotive has three cylinders. The two outside cranks are 2130 mm apart and a third one is in the centre. Each crank is 330 mm long and set at 120° apart from the others. All the revolving masses are balanced. the reciprocating masses of each cylinder are 450 kg and 66.6% of these are balanced by revolving masses placed at a radius of 800 mm, in the plane of the wheels 1252 mm aprt. The static load of each wheel is (8000 X g) newtons. Find the lowest speed in Km/hr. at which each wheel lifts from the rails. The diameter o the wheel tread is 1950 mm. **8**

11. a) Explain the equilibrium method to determine the natural frequency of vibration. **8**

b) Determine the natural frequency of oscillation of the system shown in Fig. 2 by
i) Energy method and ii) Newton's method. **8**

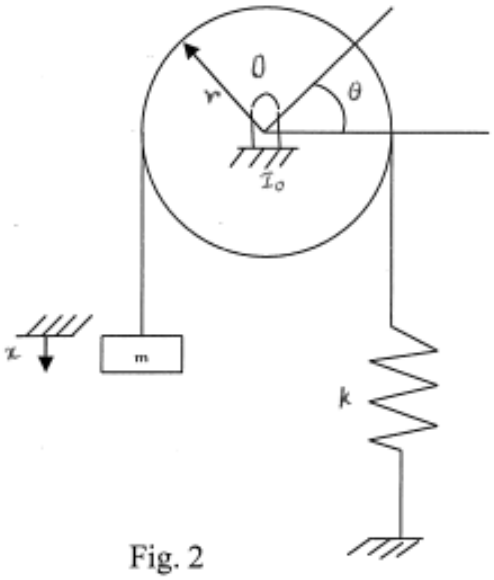

Fig. 2

OR

12. a) Explain the energy method to determine the natural frequency of vibration. **8**

b) Determine the equation of motion and the natural frequency of the system shown in Fig. 3 by
   i) Energy method
   ii) Newton's method. **8**

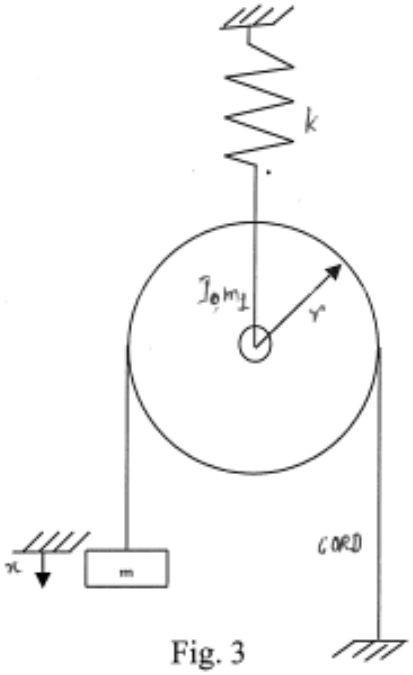

Fig. 3

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Seat No.	

T.E. (Production) (Semester – I) Examination, 2014
METROLOGY AND MECHANICAL MEASUREMENTS
(2008 Course)

Time : 3 Hours Max. Marks : 100

SECTION – I

1. a) Discuss the following. **8**
   1) Precision and Accuracy
   2) Line standard, End standard and Wavelength standard

   b) Describe with neat sketch and principal working of Angle Dekkor and state its application. **8**

OR

2. a) Explain with neat sketch slip gauge, grades of slip gauge and manufacturing of slip gauges. **8**

   b) Discuss with sketch the possible effects upon accuracy of measurement due to ; **8**
   1) Temperature variation 2) Elastic deformation
   3) Contact pressure 4) Calibration error

3. a) Describe with neat sketch and principal working of Johansson Mikrokator comparator and state its advantages and disadvantages. **8**

   b) A 70-mm m 6 shaft is to be checked by GO-NOGO snap gauges. Assume 5% wear allowance and 10% GMT. The FD for m fit is (IT7-IT6). Sketch workshop, inspection and general purpose gauges. **10**

OR

4. a) Describe Taylor's principal in design of limit gauges. **10**

   Determine the actual dimension to be provided for a shaft of hole of 90 mm size H8e9 type clearance fit. Size 90 mm falls in diameter steps of 80 mm and 100 mm. FD for 'e' type shaft is - $11D^{0.14}$.

   b) Explain with neat sketch any two methods used for inspection of straightness measurement. **8**

5. a) State and sketch clearly representation of surface roughness and explain primary, Secondary texture, mean line profile, CLA value of surface roughness. **8**

   b) Derive an expression for best wire size. **8**

   For M 16 × 2mm external threads, calculate the best wire diameter and the difference between size under wires and effective diameter.

OR

P.T.O.

6. a) Sketch and explain the meaning of various interference fringe patterns observe and how interference bands are formed using optical flat. **8**

   b) Explain with sketch working principle of Tomlinson surface recorder with its advantages and disadvantages. **8**

SECTION – II

7. a) What do you mean by mechanical measurement systems and explain with generalized block diagram and state important performance characteristics of it. **6**

   b) What is sensor ? Give its classification and state the importance in the mechanical systems. **10**

OR

8. a) Describe the selection criteria used for sensor explain with any suitable example. **8**

   b) What do you mean by Transducer ? Explain with sketches peizo electric and photo electric transducer with their advantages, disadvantages and applications. **8**

9. a) Describe the constriction and working of Knudsen gauge with neat diagram. List its advantages, disadvantages and application. **10**

   b) What do you mean by pyrometers and explain one industrial application. **8**

OR

10. a) Describe with sketch the working of Pirani gauge. List its advantages and disadvantages. **10**

    b) Explain the application of temperature measuring devices with neat sketch. **8**

11. a) Discuss the calibration of pressure measuring devices and explain one industrial application with figure. **8**

    b) What are strain gauges ? Explain the working of strain gauges in force measurement. **8**

OR

12. a) Explain with sketch the working of Pitot tube with its advantages and disadvantages. **8**

    b) What are the basic methods of torque measurement ? Write in short on maintenance and replacement of measuring equipments. **8**

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Seat No.	

T.E. (Production Engineering) (Semester – I) Examination, 2014
CUTTING TOOL ENGINEERING
(2008 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**.*

5) Drawing could be made through proportional free hand sketches.

SECTION – I

UNIT-I

1. a) Describe with a neat sketch the mechanism of chip formation. What are the important characteristics of chip formation in metal cutting ? **7**

   b) A tubing of 40 mm outside diameter is turned on lathe at a cutting speed of 15m/min. ad feed 0.1 mm/rev., the rake angle of the tool is 25 degree. The cutting force is 400 N and feed force160 N. The length of cut chip in one revolution is 50 mm. Calculate :

      a) Chip thickness ratio
      b) Shear plane angle
      c) Shear force
      d) Coefficient of friction
      e) velocity of chip along tool face. **8**

   c) Explain how power of cutting in turning is calculated. State the different factors affecting on power of cutting. **5**

OR

2. a) State the commonly used types of dynamometers. Describe any one type of two-component dynamometer. **7**

   b) In orthogonal cutting operation following data have been observed : cutting speed 0.28 m/sec, uncut chip thickness – 0.08 mm, width of the cut – 4.15 mm, chip thickness ratio – 0.6, Rake angle 18 degree. The cutting force – 360 N and feed force 125 N. Calculate – Shear plane angle, friction angle, chip velocity, shear strain in chip, shear strain rate, shear stress along shear plane, power of cutting operation. **8**

   c) Explain the conditions that leads to continuous chip, discontinuous chip and BUE chip formation. **5**

UNIT-II

3. a) List the different types of cutting tool materials used in metal cutting. What are the distinguishing features of cutting tool ? Discuss. **7**

   b) What are the three commonly used clamping methods and tooling systems for external tool holders ? Explain ISO : Ptype T_{max} P system of tooling. **8**

OR

4. a) What is the use of chip breakers ? Discuss about some non-conventional tools. **7**

   b) Write a note on ISO system for carbide grade classification. **8**

UNIT-III

5. a) State and justify the desirable properties of cutting fluids. List the additives added in fluid and their function. **7**

   b) Derive the expression for the optimum cutting speed at which cost will be minimum. **8**

OR

6. a) State the experimental method of determination of tool temperatures and describe any one of them. **7**

   b) Define tool life, tool failure in metal cutting. What are the different types of failures in a single point cutting tool ? **8**

SECTION – II

UNIT-IV

7. a) Calculate the cross section of a straight shank single point turning tool made of HSS. Data given are, allowable bending stress of HSS = 200 MPa, Young's modulus of HSS = 2×10^5 MPa, main cutting force = 1200N, permissible deflection of tool tip = 0.05 mm, also draw the tool geometry of the tool by assuming angles. **8**

   b) Explain the design procedure for reamer. **7**

OR

8. a) A key way is to be broached in the bore of a low alloy steel gear. Design a broach with following data: Bore diameter = 40 mm, Bore length = 60 mm, width of key way = 5 mm, depth of key way = 3 mm, rise per tooth = 0.02 mm, finishing teeth = 4, force to remove/mm^2 of metal is 4000 N. Also sketch the broach you designed and show dimensions on it. **10**

   b) State the various design aspects of a circular form tool. **5**

UNIT-V

9. a) State the basic rules for clamping. **5**

   b) Write a short note on :

      i) Universal jig, ii) Turning fixture. **10**

OR

10. a) Write a note on :

      i) Standardisation of jig and fixture,

      ii) Self locking cam clamping devices. **10**

   b) How long it will take a fixture costing Rs. 2,000 to pay for itself ? If buy its use it saves 15 paisa/piece over the previous method. The parts made/year are 5000 made in 5 batches, cost of each set up is Rs. 50, yearly Bank rate of interest is 10%, taxes is 5%, annual allowance for repair is 10%, overhead are 50% on labour saved. If later fixture could made for Rs. 1,600, what profit would be made if the conditions remain as before ? **5**

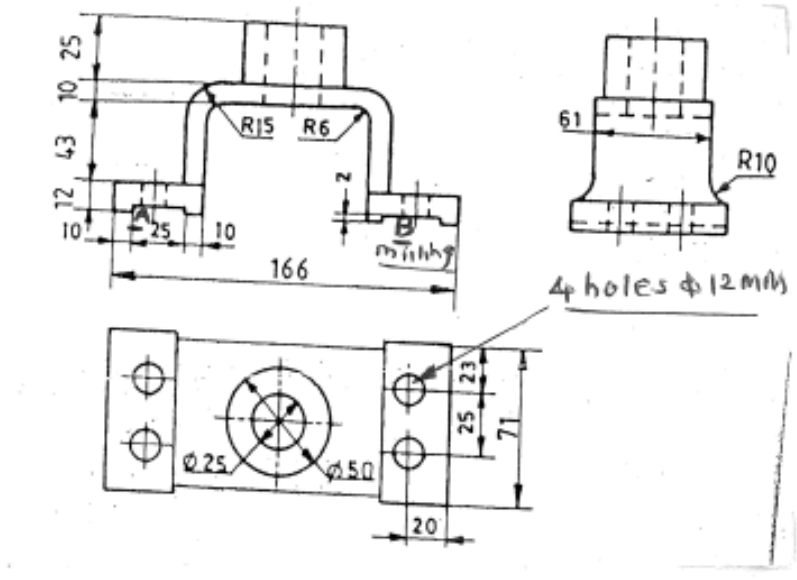
UNIT-VI

11. Design a jig for drilling 4 holes of Φ 12 mm for a component shown in fig. no. 1 **20**

OR

12. Design a milling fixture to mill at face A and B of 25 mm wide and 2 mm depth for a component shown in fig. no. 1 **20**

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



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Seat No.	

T.E. (Civil) (Semester – I) Examination, 2014
STRUCTURAL DESIGN – I
(2012 Course)

Time : 4 Hours Max. Marks : 70

***Instructions** : 1) Answer Q.**1** or Q.**2**, Q.**3** or Q.**4**, Q.**5** or Q.**6**, Q.**7** or Q.**8** and Q.**9** or Q.**10**.*
*2) **Neat** sketches must be drawn **wherever** necessary.*
*3) Figures to the **right** indicate **full** marks.*
*4) Take **Fe 410** grade of **steel**.*
*5) Take ultimate stress in bolt, f_{ub}**=400 N/mm²**.*
*6) Assume suitable data, **if necessary**.*
*7) **Use** of electronic pocket calculator **IS: 800-2007** and steel table **allowed**.*
*8) **Use** of cell phone is **prohibited** in the examination hall.*

1. a) Draw stress distribution diagram for plastic, compact, semi compact and slender section. Also classify ISHB 400 @ 77.4 kg/m and ISMC 400 @ 49.4 kg/m. **6**

   b) Determine the design strength of a column section ISLB 500 @ 75 kg/m with the effective length of the column as 5 m. Assume buckling axis as z-z axis and yield stress of steel f_y = 250 MPa. **4**

OR

2. a) A tension member of roof truss consists of 2 ISA 90 × 90 × 10 mm @ 13.4 kg/m connect to 10 mm thick gusset plate by fillet weld. Design welded connection assuming 5 mm weld size and draw the design sketch. **6**

   b) Differentiate lacing and battening in a built up column section on the basis of general and design consideration. **4**

3. a) A strut of truss consist of 2-ISA 80 × 80 × 8 mm @ 9.6 kg/m placed back to back on opposite side of gusset plate is to carry factored load of 275 kN. Design the bolted connection and draw design sketch. **4**

   b) Design a slab base for the column consisting of ISMB 400 @ 61.6 kg/m carrying an axial factored load of 450 kN. Use M20 grade of concrete. **6**

OR

4. a) A built up column of length 10 m carries a factored load of 1100 kN. The column is restrained in position but not in direction at both ends. Design a column section using two channels section. **4**

   b) A column section ISLB 350 @ 82.2 kg/m having effective length of 3.5 m is subjected to factored axial load of 450 kN and factored moment of 50 kNm. Check adequacy for section strength only. **6**

P.T.O.

5. a) A simply supported beam of effective span 6 m carries a uniformly distributed load of *w* kN/m throughout the span. The compression flange is laterally supported throughout the span. Determine the intensity of uniformly distributed load *w* so that the section ISMB 500 @ 86.9 kg/m provided for beam can carry safely. Check the case of high or low shear. **10**

   b) Explain web buckling and crippling with suitable sketches. Also state the design check for web buckling and crippling. **6**

OR

6. Design a suitable I-section for a simply supported beam of span 5 m. The beam is subjected to dead load of 25 kN/m and live load of 35 kN/m. The compression of beam is laterally unsupported throughout the span. Check for serviceability. **16**

7. a) Show the arrangement of secondary and primary floor beam in the plan of building. **4**

   b) Design a seat connection for a factored beam end reaction of 110 kN. The beam section is ISMB 250 @ 37.3 kg/m connected to the flange of column section ISHB 200 @ 37.3 kg/m using bolted connection. **12**

OR

8. A simply supported welded plate girder of span 24 m is subjected to uniformly distributed load 30 kN/m on whole span excluding self weight of plate girder. Design cross section of plate girder and check for shear buckling of web and shear capacity of end panels. Assume compression flange is laterally supported throughout the span and the yield stress of steel is f_y = 250 MPa. **16**

9. Determine the design force in the members L_0U_1, L_0L_1 and U_1L_1 of a pratt truss as shown in Fig. 9. The design wind pressure is 1200 N/m^2, the trusses are covered with A C sheet and the centre to centre spacing of truss is 6 m. **18**

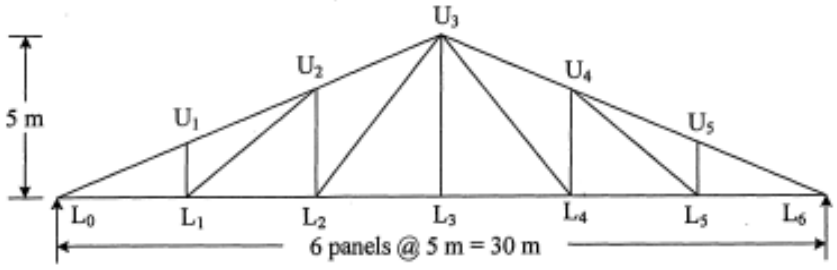

Fig. 9

OR

10. a) Determine the maximum wheel load, shear force and bending moment for the gantry girder as per following data : **10**

    Crane capacity : 200 kN

    Self weight of crane girder : 200 kN

    Self weight of trolley, motor, hook etc : 40 kN

    Min approach of hook : 1.2 m

Wheel base : 3.5 m

Span of crane girder : 16 m

Span of gantry girder : 8 m

Self weight of rail section : 300 N/m

Diameter of crane wheels : 150 mm

Crane operates : 225 days

Working hours : 9 am to 5 pm

Maximum no. of trip per hour : 03

Design life : 50 years

Grade of steel : fe 410

b) Check for fatigue strength of section of gantry girder as per data given in Q.10 a. A girder is subjected to factor moment and factor shear force of 680 kNm and 380 kN respectively. The elastic section modulus is 3765×10^3 mm^3 and the c/s sectional area is 4560 mm^2. **8**

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Seat No.	

T.E. (Civil) (Semester – I) Examination, 2014
FLUID MECHANICS – II
(2012 Course)

Time : 3 Hours Max. Marks : 70

Instructions : *1)* ***Neat*** *diagrams must be drawn* ***wherever*** *necessary.*
2) Black figures to the ***right*** *indicate* ***full*** *marks.*
3) Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is ***allowed****.*
4) Assume suitable data, if ***necessary****.*
5) Answer Q. ***1*** *or* ***2,*** *Q.* ***3*** *or* ***4,*** *Q.* ***5*** *or* ***6,*** *Q.* ***7*** *or* ***8,*** *Q.* ***9*** *or* ***10,*** *Q.* ***11*** *or* ***12****.*

1. a) What is the objective of streamlining an immersed body ? Draw the flow pattern across a flat plate when 1. Flat plate held parallel to flow of air and 2. Flat plate held perpendicular to flow of air. **4**

   b) A circular cylinder is of length 60 cm, has a diameter of 30 cm and is kept in air flow at a velocity of 15 m/s. If the C_D is 1.5 and density of 1.2 kg/m^3 find the drag force. If the same cylinder is placed in flow of water what will be the change in drag force exerted ? **4**

   OR

2. a) What is water hammer pressure and why is it developed and what are the factors which result in the development of this pressure ? **4**

   b) Find the rise of pressure in pipe line carrying water when the valve at the end of pipe is closed suddenly at 1.5 seconds. Take the dimensions of pipe as, diameter = 25 cm, length 1250 m, velocity of flow 1.5 m/s. **4**

3. a) With neat sketch of open channel and pipe flow, explain the marked difference causing flow in both case. **3**

   b) Develop the energy equation for open channel flow. **3**

   OR

4. a) What is specific energy and how does it differ from total energy ? With a neat sketch of specific energy curve, classify the type of flow in an open channel. **3**

   b) A discharge of 6000 lps flows in 3 m wide rectangular channel at a depth of 80 cm. What is the

      1) Critical depth ?
      2) Specific energy and ?
      3) Type of flow ? **3**

5. a) Determine the dimensions of a most economical trapezoidal section of an open channel to supply a discharge of 12 m^3/s with a slope of 1 in 2500. Assume side slope of 1:1 for the channel section. **4**

   b) Classify the hydraulic jump based on Froude number. **2**

   OR

P.T.O.

6. a) What is hydraulic jump and what are the practical locations of its occurrence ? Explain the importance of hydraulic jump as energy dissipator. **3**

   b) In a hydraulic jump in a rectangular channel the depth of flow before and after jump are 0.30 m and 2.5 m. Calculate
      1) Critical depth
      2) Discharge
      3) Specific energy before jump **3**

7. a) Explain the importance of impulse momentum equation and its application in the field of Hydraulic Machines. **4**

   b) A 10 cm diameter jet having velocity of 30 m/s strikes a flat plate, the normal of which is inclined at 30° to the axis of jet. Find the normal force on plate when
      1) Plate stationary
      2) Plate moves with velocity 10 m/s
      3) Determine the power and efficiency of jet when plate is stationary and moving. **6**

   c) Derive the work done and efficiency of jet striking curved unsymmetrical vane at one tip, when moving. **6**

OR

8. a) Draw a neat sketch of centrifugal pump showing all components and various heads. Obtain an expression for suction pressure at inlet of pump. **8**

   b) Classify centrifugal pump based on 1) Specific speed and 2) Number of blade. **4**

   c) The internal and external diameter of the impeller of a centrifugal pump is 300 mm and 600 mm respectively. Vane angle at inlet and outlet are 20° and 30°. Water enters impeller radially, velocity of flow over impeller is constant. If the speed of pump is 1200 rpm, find the work done by impeller. **4**

9. a) What is the difference between a hydraulic turbine and pump ? Classify the various types of Turbine. **4**

   b) Derive the condition for work done and maximum efficiency of Pelton turbine. **6**

   c) A Pelton wheel has a mean bucket speed of 25 m/s, when a jet of water flowing at rate of 1200 lps strikes the bucket under a head of 250 m ? The bucket deflects the jet through 160°. Find the power given to runner and hydraulic efficiency. Take $C_v = 0.98$. **6**

OR

10. a) What is specific speed of a turbine and derive an expression for specific speed of turbine ? **6**

   b) Why is performance study of turbine necessary and what are the various conditions under which a hydraulic turbine is required to work ? **4**

   c) What is meant by cavitation in turbines ? Explain Thoma Cavitation factor and its significance for hydraulic turbine. **6**

11. a) Explain the various types non uniform flow. Show that the dynamic equation for gradually varied flow can be expressed as

$$\frac{dy}{dx} = S_0\left[\frac{1-(y_n/y)^{10/3}}{1-(y_c/y)^3}\right]$$

Where y_n = Normal depth, y_c = critical depth, y = depth of flow, S_0 = slope of channel bed. **10**

b) What is meant by water surface profile and what are the maximum possible flow profile that can occur in open channel ? Develop the water surface profile for

1) Zone 1 in steep channel

2) Zone 3 in critical slope channel. **8**

OR

12. a) A rectangular channel 7.5 m wide carries a discharge of 20 m^3/s under a bed slope of 1 in 4500. If the depth at section is 1.5 m, determine how far upstream or downstream of this section, the depth of flow is 2.0 m. **8**

b) Discuss the necessity of finding the length of flow profile. What is control section and how is it useful for finding the length of flow profile ? **4**

c) Enlist the various direct integration method for finding the length of flow profile. Explain any one method in detail. **6**

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Seat No.	

T.E. (Production S/W) (Semester – I) Examination, 2014
MANUFACTURING TECHNOLOGY
(Self Study)
(2008 Course)

Time : 3 Hours Max. Marks : 100

Instructions *: 1)* ***All*** *questions are* ***compulsory****.*
2) Answers to the ***two*** *Sections should be written in separate books.*
3) Assume suitable data, if ***necessary****.*

SECTION – I

1. Explain : Abrasive jet machining, Ultrasonic machining, electrochemical machining, chemical machining. **16**

   OR

   Explain : EDM, wire-CutEDM. **16**

2. a) Explain different materials for processing plastics. **8**

   b) How to achieve recycling of plastics. **8**

   OR

   Explain : Calendaring, Thermoforming. **16**

3. Explain MEMS, Semiconductor and Silicon. **18**

   OR

   Explain : Nanotechnology, nanofabrication, Top down and Bottom up manufacturing. **18**

SECTION – II

4. What is comparator ? Explain construction and working of Mechanical, Electrical and optical comparator. **16**

   OR

   Explain : Optical flats, Fringe patterns and their interpretation, NPL flatness interferrometer. **16**

5. Explain principle and applications of Sine Bar , Angle Dekkor, Spirit level, Constant deviation prism. **16**

   OR

   Explain : Methods of measuring surface finish and related terminologies. **16**

6. a) Explain objectives and functions of cost estimating and estimating procedure. **12**

   b) Explain estimation of volume and weight of material. **6**

   OR

   Explain : Methods of depreciation, Replacement Techniques, Time value of Money. **18**

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[4658] – 511

Seat No.	

T.E. (Mechanical) (Semester – I) Examination, 2014
DESIGN OF MACHINE ELEMENTS – I
(2012 Pattern)

Time : 3 Hours Max. Marks : 70

***Instructions** : 1) Solve 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**.*
*2) Answer to the **two** Sections should be written in **separate** books.*
*3) Neat diagram must be drawn **wherever** necessary.*
*4) Figures to the **right** indicate **full** marks.*
*5) Use of Logarithmic tables, slide rule, electronic pocket calculator is **allowed**.*
*6) Assume suitable data, if **necessary**.*

1. a) Explain various types of failure to be considered in designing a cotter joint. Write down strength equation for each failure along with necessary sketches. **6**

   b) A solid circular shaft of diameter 'd' is subjected to a torsional moment of M_t over a length of 'L' . The permissible angle of twist is 'θ' prove that the shaft diameter is given by

$$d = \left[\frac{584\ Mt\ L}{Ge}\right]^{1/4}.$$ **4**

OR

2. a) The section of the crane hook is circular in shape whose diameter is 60 mm. The centre of the curvature of the section is at a distance of 125 mm from the inside section and the load line is 100 mm from the same point. Find the capacity of the hook if the allowable stress in tension is 75 MPa. **6**

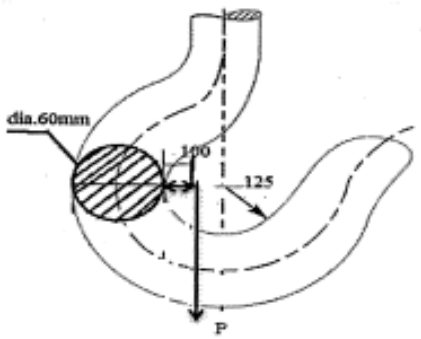

Figure 1

   b) Prove that square key is equally strong in crushing and shearing. State the assumptionsyou make. **4**

P.T.O.

3. a) Why couplings are located as near as possible to the bearings ? **2**

   b) A circular bar of 500 mm length is supported freely at its two ends. It is acted upon by a central concentrated cyclic load having a minimum value of 50 KN. Determine the diameter of the bar by taking a factor of safety of 1.5, size effect of 0.85, surface finish factor of 0.9. The material properties of bar are given by Ultimate strength of 650 MN/m^2, yield strength of 500 MN/m^2 and endurance strength of 350MN/m^2. **8**

OR

4. a) Suggest suitable coupling in the following cases : **2**

   i) Shafts having parallel axes with small distance apart.

   ii) Shafts having intersecting axis.

   b) A machine part is subjected to biaxial stress system. The stress in the X direction varies from + 30 to 110 MN/m^2 while the stress in Y direction varies from +10 to 80 MN/m^2. The frequency of vibration of these stresses is equal . The endurance limit of the machine part is 260 MPa. The ultimate tensile strength of the material is 0.66 GPa. Determine the factor of safety used by the designer. **8**

5. a) How does the helix angle influence on the efficiency of square threaded screw ? **4**

   b) A triple threaded power screw used in a screw jack has nominal diameter of 50 mm and a pitch of a 8 mm. The threads are square and length of nut 48 mm. The screw jack is used to lift a load of 8 KN. The coefficient of friction at the threads is 0.12. Calculate

   i) the principal shear stress in the screw body

   ii) the transverse shear stresses in the screw and the nut and

   iii) the unit bearing pressure. State the condition of screw with statement. **12**

OR

6. a) What is recirculating ball screw ? Explain with neat sketch. **4**

   b) A C Clamp as shown in fig (2) has a trapezoidal threads of 12 mm outside diameter and 2 mm pitch. The coefficients of friction for screw is 0.12 and for the collar is 0.25. The mean radius of the collar is 6 mm. If the force exerted by the operator at the end of the handle is 80 N. Find
   i) the length of the handle
   ii) the maximum shear stress in the body of the screw and where does this exit
   iii) the bearing pressure on the threads
   iv) efficiency of the mechanism. **12**

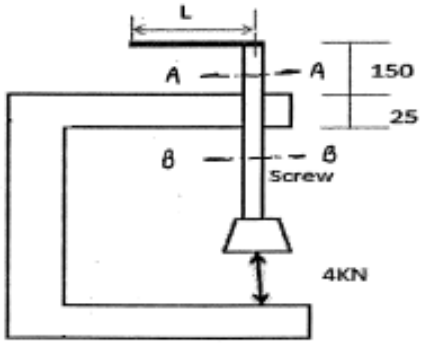

Figure 2

7. a) Explain the method of determining the size of bolt when the bracket carries an eccentric load perpendicular to the axis of the bolt. **6**

   b) Determine the size of the bolt for the joint as shown in figure (3). The bracket is made of steel. $\tau_y = 254$ MPa , factor of safety 2. **10**

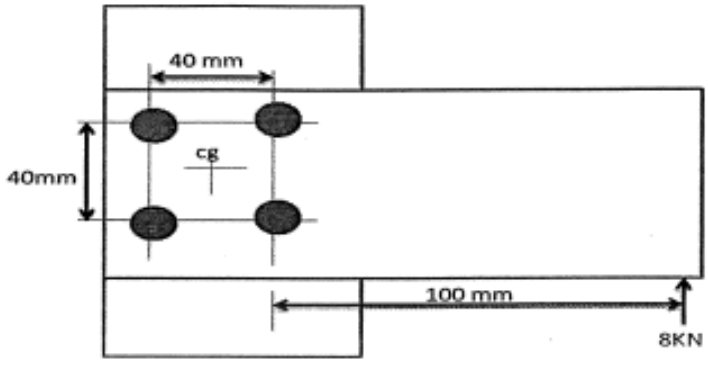

Figure 3

OR

8. a) What are the assumptions made in the design of welded joint ? Also discuss the procedure for designing an eccentric loaded welded joint. **6**

b) A welded joint as shown in figure (4) is subjected to an eccentric load. A bracket is welded to the side of a column and carries a vertical load P as shown in figure. Calculate the value of 'P' so that the maximum shear stress is 80 MPa when the size of weld is 12 mm. **10**

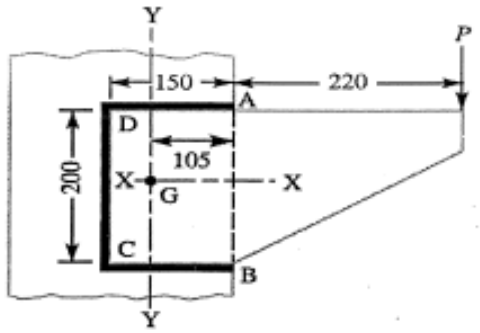

Figure 4

9. a) Explain what do you understand by A M Wahl's factor and state its importance in the design of helical springs ? **6**

b) The valve spring of a gasoline engine is 40 mm long when the valve is open and 48 mm long when the valve is closed. The spring loads are 250 N when the valve is closed and 400 N when the valve is open. The inside diameter of the spring is not to be less than 25 mm and shear stress of the spring material is 345 MN/m^2, modulus of rigidity of material is 84 GPa. Design the spring. **12**

OR

10. a) Derive an expression for the shear stress induced in a helical compression spring with usual notations. **6**

b) Design a concentric spring for an air craft engine valve to exert a maximum force of 5000 N under a deflection of 40 mm. Both the springs have same free length, solid length and are subjected to equal maximum shear stress of 0.85 GPa, spring index for both spring is 6. Assume G = 80 GPa and diametral clearance to be equal to difference between wire diameter. **12**

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Seat No.	

T.E. (Mechanical/Automobile Engg./Mech.-S/W) (Semester – I) Examination, 2014
(2012 Course)
THEORY OF MACHINES – II

Time : 3 Hours Max. Marks : 70

Instructions *: 1) Answer Q.* ***1*** *or Q.* ***2****, Q.* ***3*** *or Q.* ***4****, Q.* ***5*** *or Q.* ***6****, Q.* ***7*** *or Q.* ***8****, Q.* ***9*** *or Q.* ***10****.*
2) ***Neat*** *diagrams must be drawn* ***wherever*** *necessary.*
3) Figures to the ***right*** *side indicate* ***full*** *marks.*
4) Assume suitable data, if ***necessary****.*

1. a) Derive a relation for minimum number of the teeth on the gear wheel and pinion to avoid interference. **6**

   b) Explain the meaning of following terms with neat sketches, **6**
   i) Helix angle
   ii) Transverse pitch
   iii) Normal pressure angle
   iv) Normal pitch.

OR

2. a) A gear pair of involute profile with pressure angle of 14.5° has a module of 4 mm and the number of teeth 25 and 60. If the addendum is one module and dedendum is 1.157 times the module, determine the length of arc of contact and contact ratio. **6**

   b) Explain with a neat sketch force analysis of Bevel gear. **6**

3. A reverted gear train shown in fig. is used to provide a speed ratio of 10. The module of gears 1 and 2 is 3.2 mm and of gears 3 and 4 is 2 mm. Determine suitable numbers of teeth on each gear. No gear is to have less than 20 teeth. The centre distance between shaft 160 mm. Ratio for Gears 1 and 2 is 2.5 and for gears 3 and 4 is 4. **8**

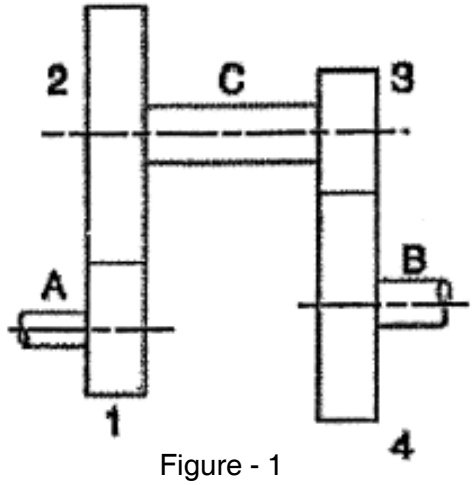

Figure - 1

OR

4. Explain tabulation method for epicyclic gear train and write speed of different elements. **8**

5. a) Describe the axially displaceable cone CVT along with its comparison with other variators. **6**

   b) A four wheel vehicle of mass 2500 kg has a wheel base 2.5 m, track width 1.5 m, and height of centre of gravity 0.6 m above the ground level and lies at 1 m from the front axle. Each wheel has an effective diameter of 0.8 m and a moment of inertia of 0.8 kg.m^2. The drive shaft, engine flywheel and transmission are rotating at four times the speed of road wheels, in clockwise direction when viewed from the front, and is equivalent to a mass of 80 kg having a radius of gyration of 100 mm. If the vehicle is taking a right turn of 60 m radius at 60 km/h, find the load on each wheel. **10**

OR

6. a) Compare stepped and stepless regulation of speeds. And explain different types of face plate variators. **6**

   b) A ship is propelled by a turbine rotor of mass 500 kg and has a speed of 2400 rpm. The rotor has a radius of gyration of 0.5 m and rotates in clockwise direction when viewed from stern. Find the gyroscopic effects in the following cases : **10**

   a) The ship runs at a speed of 15 knots (1 knot = 1860 m/h). It steers to the left in a curve of 60 m radius.
   b) The ship pitches $\pm 5°$ from the horizontal position with the time period of 20 sec of simple harmonic motion.
   c) The ship rolls with an angular velocity of 0.04 rad/s clockwise when viewed from stern. Also calculate the maximum acceleration during pitching.

7. a) Explain following terms : **6**

   i) Function Generation
   ii) Path Generation
   iii) Precision Points
   iv) Structural Error.

   b) Using Freudenstein equation, design a four bar mechanism to generate the function $y = x^{1.4}$ for an interval in x from 1 to 4. The input link is to start from 30° and is to have a range of 90°, the output link is to start from 90° and is to have a range of 90°. Use three point Chebychev spacing.

   Take the length of fixed link as 50 mm. **10**

OR

8. a) Explain three position synthesis of single slider mechanism by using relative pole method. **8**

   b) Synthesis a four bar mechanism by the method of inversion. **8**

   Assume the following data,

   1) Length of fixed link is 80 mm and input link length is 25 mm.
   2) Initial position of input link 30° and 2-positions of the input link from the initial position 30° and 60°.
   3) 2-positions of the output link from the initial position 20° and 40°. And determine the length of coupler link, output link and initial position of output link.

9. a) A cam is to operate an offset follower. The least radius of the cam is 50 mm, roller diameter is 20 mm, and offset is 12 mm. The cam is to rotate at 360 rpm. The angle of ascent is 48°, angle of dwell is 42°, and angle of descent is 60°. The motion is to be SHM during ascent and uniform acceleration and deceleration during descent. Draw the cam profile. Also calculates the maximum velocity and acceleration during descent. Lift of follower is 40 mm. **14**

   b) Explain displacement curve for Cycloidal motion of follower. **4**

OR

10. a) The following data relate to a cam operating an oscillating roller follower : Minimum radius of cam = 30 mm, Radius of roller = 10 mm, Length of follower arm = 45 mm, Distance of fulcrum centre from cam centre = 55 mm, Angle of ascent = 80°, Angle of descent = 100°, Angle of dwell between ascent and descent = 60°, Angle of oscillation of follower = 30°. Draw profile of the cam if the follower moves with SHM and returns with uniform acceleration and retardation. **14**

   b) Derive expressions for displacement for circular arc cam operating a flat faced follower, When the contact is on the nose. **4**

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Seat No.	

T.E. (Mech. S/W) (Semester – I) Examination, 2014
NUMERICAL METHODS & COMPUTATIONAL TECH.
(2012 Course)

Time : 3 Hours Max. Marks : 70

Instructions *: 1)* ***Neat*** *diagrams must be drawn* ***wherever*** *necessary.*
2) Black figures to the ***right*** *indicate* ***full*** *marks.*
3) ***Use*** *of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is* ***allowed****.*
4) Assume suitable data, if ***necessary****.*

1. a) Solve the equation $x^3 - 3x^2 - 5.5x + 9.5 = 0$ using Newton-Raphson method for 6 iterations with an accuracy of 3 digits and initial guess as 0. **6**

   b) Explain the selection criteria for Numerical Interpolation Methods. **4**

OR

2. a) List different numerical methods for extrapolation and explain them in brief. **4**

   b) Find the area under the curve and x-axis, curve passes through the following points – (1.00, 2.00), (1.50, 2.40) (2.00, 2.70) (2.50, 2.80) (3.00, 3.00), (3.50, 2.60) (4.00, 2.10). **6**

3. a) Write in brief about Forward difference table. **2**

   b) Solve the simultaneous equation by Guass Elimination Method with Partial Pivoting

   $2x_0 - 1x_1 + 7x_2 + 1x_3 = 7.50$

   $9x_0 - 4x_1 + 1x_2 - 3x_3 = 4.00$

   $1x_0 - 11x_1 + 6x_2 - 2x_3 = -9.50$

   $-2x_0 + 4x_1 + 2x_2 - 3x_3 = 6.00.$ **8**

OR

4. a) Explain in brief : Inverse Interpolation. **2**

   b) Solve the given simultaneous equation by Gauss Elimination Method and find whether the equations are consistent.

   $x_0 + 4x_1 - 2x_2 = 3$

   $2x_0 + 2x_1 + 0x_2 = 4$

   $3x_0 + 0x_1 - 1x_2 = 2.$ **8**

P.T.O.

5. a) What is the Least square criteria for curve fitting ? Derive the normal equations to fit the straight line. **8**

   b) The pressure p of gas corresponding to various volumes v is measured, given by the following data : Fit the data to the equation $pv^y = C$ **8**

v	50	60	70	90	100
p	64.7	51.3	40.5	25.9	78

OR

6. a) Draw the flowchart to fit the polynomial (ax^2+bx+c) using least square technique for the set of N data points. **8**

   b) An object is suspended in a wind tunnel and the force measured for various levels of wind velocity. The results are tabulated below. Use least square regression to fit the straight to this data. **8**

v, m/s	10	20	30	40	50	60	70	80
F, N	25	70	380	550	610	1220	830	1450

7. a) The projectile is launched upward from the earth's surface. Assuming the only force acting on the object is downward force of gravity. Under these conditions the force balance can be used to derive $\frac{dv}{dt} = -g(0)\left(\frac{R^2}{(R+x)^2}\right)$

   Where v = upwards velocity (m/s), t = time (s), x = altitute (m) measureds upwards from the earth's surface, g(0) = 9.81 m/s^2, and R = the earth's radius (6.37×10^6m), Since dx/dt = v, use Euler's method to determine the maximum height that would be obtained if v(t = 0) = 1400 m/s. **8**

   b) Solve the ODE using modified Euler's method. **8**

   $\frac{dy}{dx} = \frac{y-x}{y+x}$; y(0) = 1 for x = 2 with h = 1.

OR

8. a) A 2 kg mass is attached to spring with a spring constant of k = 5. The governing ODE for displacement y and time t is given as $\frac{d^2y}{dt^2} + m\frac{dy}{dt} = -ky$. Find displacement at time t = 0.5, given y(0) = 2, and $y'(0) = -4$. **8**

b) Use Milne's predictor-corrector method to solve $\frac{dy}{dx}=\frac{2y}{x}$, for y(2) with y(1) = 2 using h = 0.25.

Given y(1.25) = 3.124, y(1.5) = 4.45, and y(1.75) = 6.124. **8**

9. a) Solve $\frac{\partial u}{\partial t}=\frac{\partial^2 u}{\partial x^2}$ for the following conditions by using Cranck-Nicolson method. **10**

At x = 0 and x = 3, u = 0 for all t's

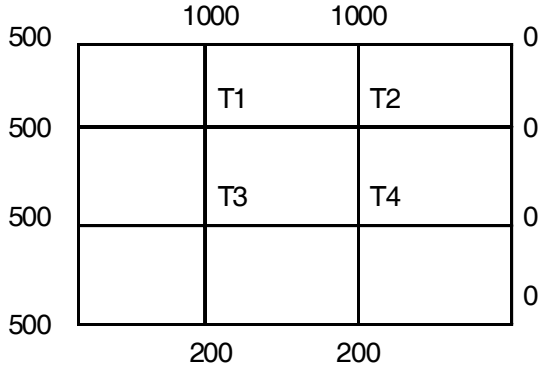
At t = 0, u = x2 for 0 <x < 3.

Assume h = 1, k = 0.1 Find u at t = 0.3.

b) Draw the flowchart solving Laplace equation. **8**

OR

10. a) The edges of a steel plate of 500×500 mm has maintained at temperatures as shown in fig. Find the steady state temperatures at the interior points. **10**



b) Draw the flowchart for solving wave equation. **8**

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Seat No.	

T.E. (Automobile Engineering) (Semester – I) Examination, 2014
DESIGN OF MACHINE ELEMENTS
(2012 Course)

Time : 3 Hours Max. Marks : 70

Instructions : *1) Answer Q. **1** or Q. **2,** Q. **3** or Q. **4,** Q. **5** or Q. **6,** Q. **7** or Q. **8,** Q. **9** or Q. **10**.*
*2) **Neat** diagrams must be drawn **wherever** necessary.*
*3) Figures to the **right** side indicate **full** marks.*
*4) Assume suitable data if **necessary**.*

Unit – I & Unit – II

1. a) Explain the various types of failure in the Knuckle joint. **6**

   b) What is torsional and lateral rigidity of shaft ? State the applications where rigidity is the design criterion. **4**

OR

2. a) What are preferred number series ? Establish R10 series. What are applications of preferred number ? **6**

   b) Derive strength equatin of flat key based on shear and compression types of failure. **4**

Unit – II & Unit – III

3. a) Under what circumstances are hollow shafts preferred over solid shaft. Give any two examples where hollow shaft is used. **2**

   b) The following data is given for a screw jack : **8**

   Nominal diameter of a screw = 40 mm

   Pitch of square threads = 7 mm

   Coefficient of thread friction = 0.15

   Coefficient of collar friction = 0.1

   Effective mean diameter of collar = 70 mm

   The operator can comfortably exert a force of 150 N at a radius of 1.2 m to raise the load. Assuming a single start threads. Calculate :

   The maximum load that can be lifted.

   Efficiency of the screw and

   Overall efficiency.

OR

P.T.O.

4. a) What are the requirements of a good coupling ? **2**

   b) A welded connection as shown in Fig. 1 is subjected to an eccentric load of 7.5 kN. Determine the size of welds if permissible shear stress for weld is 100 N/mm^2. **8**

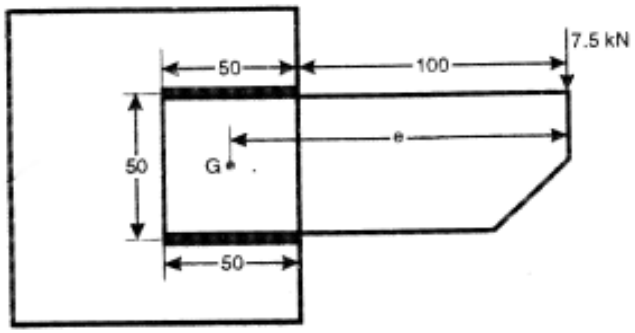

Fig. 1

Unit – IV

5. A stepped shaft is subjected to a uniform torque of 200 Nm and a completely reversed bending moment of 550 Nm at the step. The shaft is made of cold drawn steel with ultimate tensile strength of 650 N/mm^2 and yield strength of 380 N/mm^2. The theoretical stress concentration factor for bending and torsion are 2 and 1.6 respectively. The other factors are as follows :

   Notch sensitivity = 0.96

   Size factor = 0.85

   Reliability factor = 0.868

   Surface finish factor = 0.9

   If the factor of safety is 1.5, determine the diameter of the shaft corresponding to the expected life of 15000 cycles. **16**

OR

6. A cantilever beam made of coid drawn steel 40C8 (S_{ut} = 600 N/mm^2 and S_{yt} = 380 N/mm^2) is shown in Fig. 2. The force P acting at the free end varies from –50 N to +150 N. The expected reliability is 90% for which the reliability factor is 0.897. The surface finish factor and size factor are 0.77 and 0.85 respectively. The notch sensitivity at the fillet is 0.9 and theoretical stress concentration factor is 1.44. If the factor of safety is 2, determine the diameter 'd' by using modified Goodman diagram. **16**

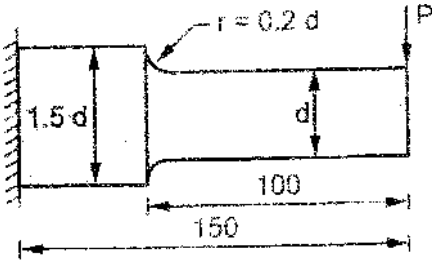

Fig. 2

Unit – V

7. A single row deep groove ball bearing is operated with the following work cycle. If the expected life of the bearing is 13000 hours with reliability of 90%, calculate the dynamic load rating of the bearing and determine reliability of the system consisting of four such bearings. The work cycle is **16**

Element No.	Element Time	Radial Load 'Fr' in KN	Axial Load 'Fa' in KN	Radial Factor 'X'	Thrust Factor 'Y'	Race Rotating	Service Factor	Speed in RPM
1.	30%	5.0	1.5	0.56	1.1	Inner	1.25	960
2.	40%	3.7	0.73	0.56	1.3	Outer	1.4	1440
3.	Remaining	–	–	–	–	Outer	–	720

OR

8. The following data is given for a 360° hydrodynamic bearing : **16**

Radial load = 10 KN

Journal speed = 1440 rpm

Unit bearing pressure = 1000 KPa

Clearance ratio (r/c) = 800

Viscosity of lubricant = 30 mPa-s

Bearing length (l)/Journal diameter (d) = 1

Assume that the total heat generated in the bearing is carried by the total oil flow in the bearing. Take density of lubricating oil = 860 Kg/m^3 and specific heat (C_p) = 1.76 KJ/Kg°C. Calculate :

i) Dimensions of bearings
ii) Coefficient of friction
iii) Power lost in friction
iv) Total flow of oil
v) Side leakage
vi) Temperature rise
vii) Average temperature (inlet temperature is 40°C)
viii) Find maximum pressure

Dimensionless Parameters for Full Journal bearings.

$\frac{l}{d}$	$\frac{h_0}{c}$	ε	S	$\left(\frac{r}{c}\right)f$	$\frac{Q}{r\,c n_s l}$	$\frac{Q_s}{Q}$	$\frac{P_{max}}{P}$
1	0.8	0.2	0.631	12.8	3.59	0.280	1.890
	0.6	0.4	0.264	5.79	3.99	0.497	2.066

Unit – VI

9. A spur gear pair is used to transmit 7.5 KW power from an electric motor running at 1440 rpm to a machine at 360 rpm. The pinion and gear are made of plain carbon steel 55C8 (S_{ut} = 720 N/mm^2). The tooth system is 20° full depth involute and number of teeth on pinion as minimum as possible. The service factor and load concentration factor are 1.25 and 1.2 respectively. The face width is 12 times module. The gear is machined to meet the specificaiton of grade 7. Design the gear pair by using velocity factor and Buckingham's equation for dynamic load. Assume factor of safety 1.2. Also suggest the case hardness for gear pair. Use the following data : **18**

Use the following data :

Load stress factor K = 0.16 (BHN/100)^2 N/mm^2

Lewis form factor Y = 0.484 – 2.87/Z

For Grade 7 e = 11.0 + 0.9 (m + 0.25 $\sqrt{d}$)

Deformation factor C = 0.111e(Ep.Eg/Ep + Eg) N/mm

Modulus of elasticity for pinion Ep = 210 X 10^3 N/mm^2

Modulus of elasticity for gear Eg = 210 X 10^3 N/mm^2

Buckingham's equation = 21V(bC + Ftmax)/21 V + $\sqrt{bC + Ftmax}$ N

Ftmax = Ka.Km.Ft

Standard module in mm –1, 1.25, 1.5, 2.0, 2.5, 3.0, 4.0, 5.0, 6.0, 8.0, 10.0, 12, 16

OR

10. The following data is given for a pair of parallel helical gears : **18**

Power transmitted = 20 KW

Pinion speed = 720 rpm

No. of teeth on pinion = 35

No. of teeth on gear = 70

Normal pressure angle = 20°

Helix angle = 23°

Face width = 40 mm

Velocity factor = 5.6/(5.6 + V_p)

Ulltimate tensile strength for steel pinion and gear = 600 N/mm^2

Service factor = 1.5

Factor of safety = 2

Deformation factor, C = 11400 e

Finished grade 6, e = 8.00 + 0.63 ϕ, where ϕ = m + 0.25 (d)$^{1/2}$

Here m-module in mm and d = PCD of pinion/gear in mm

Estimate :

a) the normal module and dimensions of pinion and gear
b) the beam strength
c) the dynamic load using Buckingham's equation
d) the surface hardness for the gears and check the wear strength of the gear.

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Seat No.	

T.E. (Electrical) (Semester – I) Examination, 2014
ADVANCED MICROCONTROLLER AND ITS APPLICATIONS
(2012 Course)

Time : 3 Hours Max. Marks : 70

***Instructions** : 1) Answer **all** questions.*
*2) Neat diagrams must be drawn **wherever** necessary.*
*3) Figures to the **right** side indicate **full** marks.*
*4) **Use** of calculator is **allowed**.*
*5) Assume suitable data if **necessary**.*

1. a) Compare Harvard and Van Neumann architecture. **7**

   b) Explain any three addressing modes of PIC 18 with one example each. **6**

   c) Write an assembly program using the timer1 interrupt to create a square wave of 3 KHz on pin RB7. Assume XTAL = 10 MHz. **7**

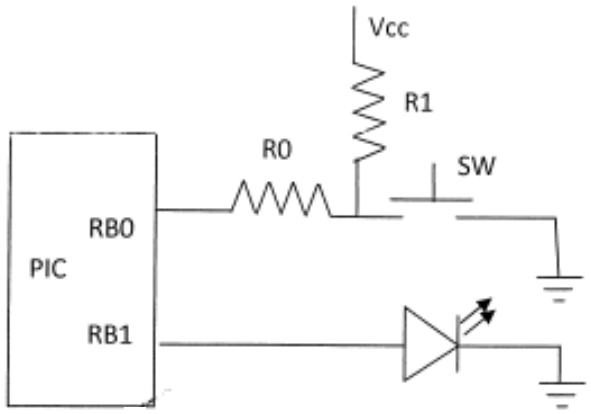
OR

2. a) Explain the status register of PIC 18 microcontroller. **6**

   b) Write an assembly language program to add the constant AAH to the contents of file reg 0 × 36 and store the result in file reg 0 × 40. **7**

   c) Explain different I/O ports and associated SFRs of PIC 18F458. **7**

3. a) A LED is connected to port pin RBI and a switch (SW) is connected to RB0 as shown in figure. Write a program which will continuously monitor status of port pin RB0 and switch on LED when the switch is closed. **8**



   b) Explain the functions of pins associated with LCD (16 × 2) and draw a flowchart for outputting data on LCD. **8**

OR

P.T.O.

4. a) Write a program to transfer a letter 'A' serially and continuously at a baud rate of 9600. Assume crystal frequency of 10 MHz. **8**

   b) Write a short note on SPI protocol. **8**

5. a) Explain compare mode of operation of PIC 18 and also explain SFR CCP1 CON register in detail. **8**

   b) Using compare mode, write the assembly language program to toggle the LED every 10 pulses. Use Timer 1 as counter. **8**

OR

6. a) Create a 2 KHz PWM frequency with 25% duty cycle on the CCP1 pin. Assume XTAL = 10 MHz. **8**

   b) Explain PIC 18 connection to the stepper motor and write the code to rotate continuously in anticlockwise direction. **8**

7. a) Explain features of on-board ADC and the following SFR's in detail ADCON1 ADCON 0. **9**

   b) Show interfacing of LM35 with PIC 18F458. Write a program to measure and display temperature. **9**

OR

8. a) Explain how current is measured using PIC 18F458. Write a program to measure current and display result in PORT D. **9**

   b) Explain with a neat diagram, interfacing of DAC with PIC microcontroller and write a program for sawtooth waveform generation using DAC. **9**

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Seat No.	

T.E. (Electrical)(Semester – I) Examination, 2014
POWER ELECTRONICS
(2012 Course)

Time : 3 Hours Max. Marks : 70

1. a) For SCR, account for switching losses and effect of switching frequency on power loss. **5**
   b) Explain 'dynamic chara' of SCR. **5**

OR

2. a) Explain single phase dual converter with circulating current mode. **5**
   b) Explain single phase ac regulator feeding RL load. Draw output voltage waveform. **5**

3. a) Compare output voltages available from 1ph and 3 ph. fully controlled bridge rectifiers based on magnitude, ripple content and ripple frequency. **5**
   b) Explain use of diode as FWD and feedback diode for inductive loads. **5**

OR

4. a) Draw and explain gate chara of SCR. **5**
   b) Explain 3 ph. semicontrolled rectifier feeding RL load. Write output voltage expression. **5**

5. a) Explain Type C chopper operation with circuit diagram and waveforms. **8**
   b) Compare MOSFET, IGBT and power transistor with neat symbols and SOAs **8**

OR

6. a) Draw VI chara of MCT and explain operation. **8**
   b) For a chopper feeding inductive load with R = 4 Ω & L = 6 mH from 200 V source at 50% duty and 1kH_2 switching frequency, find
      i) Maxi and Mini load current
      ii) Peak to Peak ripple current
      iii) Av. voltage and Av. load current.

7. a) Explain working of 1ph bridge inverter feeding RL load. Draw voltage and current waveforms and comment on need for feedback diodes. **8**
   b) Explain multiple pulse width Modulation Technique for Inverter control. Explain modulation indices and effect on harmonic control. **8**

OR

8. a) Explain why quasi square output voltage has better performance than square wave output. How 1ph. inverter bridge can be operated to give quasi square output ? **8**
   b) Explain sinusoidal PWM technique for inverters. How voltage and freq. control is achieved ? **8**

P.T.O.

9. a) Draw 3 ph inverter bridge to feed 3 ph resistive load (star connected) using 180° mode of conduction. Draw control signals for devices used and output phase and line voltage. **10**

   b) Compare CSI and USI based on working and advantages. **8**

OR

10. a) What is the need of using multilevel inverters ? Explain one type of multilevel inverter. **10**

    b) Compare and comment on Multipulse and Multilevel inverter output voltages. **8**

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Seat No.	

T.E. (Electronics) (Semester – I) Examination, 2014
DATA COMMUNICATION
(2012 Course)

Time : 3 Hours Max. Marks : 70

Instructions : *1)* ***Neat*** *diagrams must be drawn* ***wherever*** *necessary.*
2) Black figures to the ***right*** *indicate* ***full*** *marks.*
3) ***Use*** *of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is* ***allowed****.*
4) Assume suitable data, if ***necessary****.*

1. a) Explain MLT3 and 2B1Q coding technique with suitable examples. **6**

   b) What is Hamming code ? What are its features ? **7**

   c) List the seven layers and its functionality is OSI model. **7**

   OR

2. a) Explain the duties of physical layer and data link layer in OSI model. **6**

   b) Describe quantization processes. What is A-law and μ-law companding ? **7**

   c) Describe role of code tree and state diagram in consolution codes. **7**

3. a) A source produces one of the four symbols with probabilities $P_0 = 0.4$, $P_1 = 0.25$, $P_2 = 0.25$ and $P_3 = 0.1$, Calculate the average information gained per symbol. **8**

   b) For a binary symmetric channel show that $I(x, y) = H(Y) + p \log_2 P + (1 - p) \log_2 (1 - p)$. **8**

   OR

4. a) An information source is producing sequence of four independent symbols with following probabilities $p(x_1) = 0.4$ $p(x_2) = 0.1$ $p(x_3) = 0.2$, $p(x_4) = 0.3$.
      i) Obtain binary code using Huffman code.
      ii) Compute code efficiency. **8**

   b) Write notes on :
      i) BSC
      ii) Mutual information. **8**

5. a) Derive an expression of minimum probability of error for BPSK. **7**

   b) Describe the OF DM system. **4**

   c) Explain QPSK modulation and demodulation scheme in detail. **7**

   OR

P.T.O.

6. a) Explain principle of DPSK encoding with suitable example. **7**

   b) Compare the noise performance of BASK and BPSK for common transmitting conditions of similar noisy environment. **4**

   c) What is OQPSK ? What are its advantages and disadvantages ? **7**

7. a) With the help of suitable block diagram explain FH-SS system. **8**

   b) A PN-sequence is generated using four-stage shift registers with feedbacks from the outputs of 2^{nd} & 4^{th} stage. Assuming the initial contents of shift registers to be 0010. Determine the O/P sequence. What is length of a sequence ? **8**

   OR

8. a) Why we go for spread spectrum techniques ? Describe DS-SS. **8**

   b) State of explain properties of PN sequence. **4**

   c) Calculate the spreading factor for a system working with 200 KHz message bandwidth using 1.83 MHz chip frequency. **4**

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Seat No.	

T.E. (Electronics) (Semester – I) Examination, 2014
NETWORK SYNTHESIS
(2012 Pattern)

Time : 3 Hours Max. Marks : 70

Instructions : *1) Answer Q. **1** or Q. **2,** Q. **3** or Q. **4**, Q. **5** or Q. **6**, Q. **7** or Q. **8**.*
*2) Neat diagrams must be drawn **wherever** necessary.*
*3) Figures to the **right** side indicate **full** marks.*
*4) **Use** of electronic pocket calculator is **allowed**.*
*5) **Assume** suitable data if **necessary**.*

1. a) Test whether the following function is positive real function, **6**

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

b) Synthesize the following function using foster-I and cauer-I form, **6**

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

c) State the properties of Transfer function and synthesize the following transfer function

$$Z_{21}(s) = \frac{s^2}{s^3 + 3s^2 + 4s + 2}$$

as a $1\,\Omega$ terminated two port LC ladder network. **8**

OR

2. a) Define all the transfer functions for a two port network. Also explain effect of location of poles and zeros of transfer function on response of the network. **7**

b) State and explain the properties of LC immittance function and also indicate which of the following functions are LC, RC, RL or RLC impedance functions. **7**

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

ii) $Z(s) = \frac{s^2 + 4s + 3}{s^2 + 6s + 8}$

iii) $Z(s) = \frac{s^4 + 5s^2 + 6}{s^3 + s}$

P.T.O.

c) What is the residue condition ? Show that it is valid for the network shown below in Fig. 1 **6**

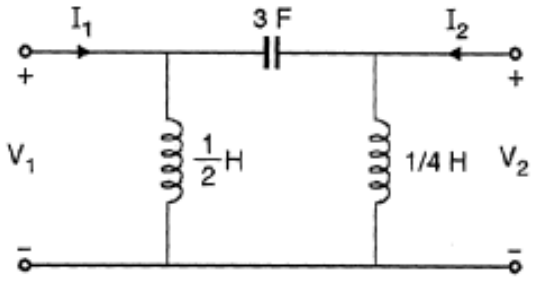

Figure 1

3. a) Compare Butterworth and Chebyshev Approximation Techniques. **4**

b) Determine the transfer function and realize low pass Butterworth approximation filter whose requirements are characterized by, **8**

A_{max} = 1dB, A_{min} = 30 dB, ω_p = 80 rad/sec, ω_s = 350 rad/sec

c) Normalized third order Low pass filter is shown below in Fig. 2 **4**

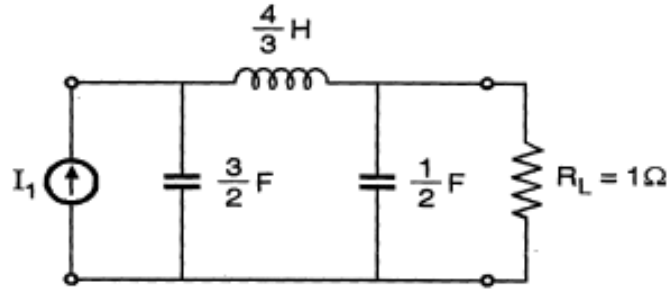

Figure 2

Design the corresponding high pass filter with its cutoff frequency ω_c=10^6 rad/sec and the impedance load of 500 Ω.

OR

4. a) Explain frequency and impedance scaling with suitable example. **6**

b) State the properties of Butterworth Approximation. **4**

c) Determine the transfer function of Chebyshev low pass filter to meet the following specification, **6**

i) 1 dB ripple in the pass band.

ii) Cut off frequency ω_c = 10 × 10^5 rad/sec.

iii) The magnitude must be down to 25 dB at ω = 3 × 10^6 rad/sec.

5. a) Differentiate between passive and active filters. **4**

   b) Synthesize 2nd order active low pass Butterworth filter to have a cut off frequency of 159.15 kHz. Then using RC-CR transformation, realize HPF with same cut off frequency. **6**

   c) What are the advantages and disadvantages of active filter ? **6**

OR

6. a) Design 2nd order Sallen and Key high pass Butterworth filter having cut off frequency of 300 Hz. **4**

   b) Explain the different biquad feedback topologies used in active filter designing and list the important observations. **6**

   c) Synthesize the following high pass filter function using RC-CR transformation. **6**

$$H(s) = \frac{ks^3}{s^2 + s + 36}$$

7. a) Define sensitivity. Give some of its important properties. **4**

   b) Explain the concept of gain sensitivity. Also explain the various factors affecting the gain sensitivity. **6**

   c) Explain effect of the following op-amp characteristics on the active filter. **8**
      i) Input offset voltage
      ii) Input bias current
      iii) Slew rate
      iv) CMRR.

OR

8. a) For the series RLC circuit shown in Fig. 3, find transfer function. Calculate the sensitivities of K, the resonant frequency ωp, the quality factor (Q_p) with respect to R, L and C. Comment on the result obtained. **6**

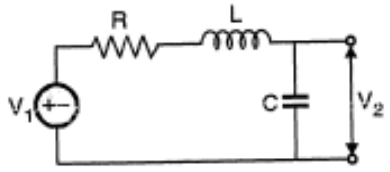

Figure 3

b) Prove the following sensitivity relationships **6**

i) $S_x^{p^n} = nS_x^p$

ii) $S_{\sqrt{x}}^p = 2S_x^p$

iii) $S_x^{y+c} = \frac{y}{y+c} S_x^y$

c) The op-amp used in the inverting circuit shown in Fig. 4, has an input bias current of 600 nA and an input offset current that can range between $\pm$ 100 nA. Find the resulting maximum output offset voltage. **6**

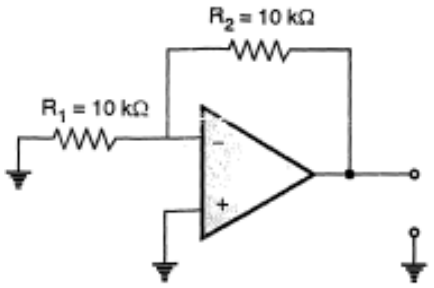

Figure 4

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Seat No.	

T.E. (Electronics) (Semester – I) Examination, 2014
MICROCONTROLLER AND APPLICATIONS
(2012 Course)

Time : 3 Hours | Max. Marks : 70

Instructions : *1) Solve Q. **1** or Q. **2**, Q. **3** or Q. **4**, Q. **5** or Q. **6**, Q. **7** or Q. **8**.*
*2) Draw neat diagram **wherever** necessary.*
*3) Assume suitable data, if **necessary.***

1. a) Explain hardware debugging tools used for debugging. **6**
   b) Explain RS232 protocol with hardware interfacing diagram. **8**
   c) Explain internal memory organization of 8051. **6**

OR

2. a) Explain software debugging tools used. Explain any one IDE with its features. **8**
   b) Describe RS485 protocol compare it with RS232. **6**
   c) What are the power down modes of PIC18fxxx ? How does clock frequency affect the performance of microcontroller ? **6**
3. a) Explain interrupts structure of PIC18fxxx. How multiple interrupts are mapped ? **8**
   b) Interface 4 × 4 keypad to PIC microcontroller and write C program. **8**

OR

4. a) How PWM waveform is generated ? Explain with necessary control register and internal block diagram. **10**
   b) What are the commands for initialization of LCD ? **6**
5. a) What is MSSP module ? Explain 12C protocol ? **8**
   b) Write C code for transmitting “Hello” serially to PC with baud rate 9600. **8**

OR

6. a) Write C code for reading analogue voltage and displaying it on hyper terminal using ADC. **8**
   b) Explain SPI protocol with timing diagram. Compare it with 12C protocol. **8**

P.T.O.

7. a) Design voltmeter for range 0 to 100 V. Design hardware circuit and interfacing diagram with PIC18fxxx. Use LCD display. Provide 1M input impedance and protection up to 250 V. **8**

   b) Design DAS using 18fxxx for 8 inputs. Use LM35 as one of the input. Use 16 × 2 display draw interfacing diagram and flow chart for software implementation. **10**

OR

8. a) Design frequency counter using 18fxx for following specifications.

   Frequency range Dc to 1 MHz

   Min Input 50 mv

   Max input 250 V

   Design and draw interfacing circuit. Also explain required flow chart. **10**

   b) Design control circuit for Dc motor using PWM technique. Explain motor driving circuits for controlling speed and direction as well. **8**

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Seat No.	

T.E. (E & TC) (Semester – I) Examination, 2014
SYSTEM PROGRAMMING AND OPERATING SYSTEMS
(2012 Course)

Time : 3 Hours Max. Marks : 70

***Instructions** : 1) Answer Q. **1** or Q. **2**, Q. **3** or Q. **4**, Q. **5** or Q. **6**, Q. **7** or Q. **8**.*
*2) **Neat** diagrams must be drawn **wherever** necessary.*
*3) Figures to the **right** side indicate **full** marks.*
*4) Assume suitable data if **necessary**.*

1. a) Explain top down parsing with an example. **7**

   b) List different types of loaders and explain any one of them. **7**

   c) Explain synthesisphase of a compiler. **6**

OR

2. a) Explain the terms : Compiler, Loader, Linker, Operating System. **7**

   b) Explain Translated origin, Link origin, Load origin Relocation factor. **7**

   c) Explain nested macros with example. Also explain expansion time variables with example. **6**

3. a) Explain various states of a process with diagram. **6**

   b) List the categories of system calls and explain process system call with an example. **6**

   c) Find out the safe sequence for execution of 3 processes using Bankers algorithm
   Maximum Resources : $R_1 = 15$, $R_2 = 8$ **6**

Allocation Matrix **Maximum Requirement Matrix**

	R1	R2		R1	R2
P1	2	1	P1	5	6
P2	3	2	P2	8	5
P3	3	0	P3	4	8

OR

4. a) Explain different models of threads. **6**

   b) Explain dining philosopher's problem and Producer-Consumer problem with solution. **6**

P.T.O.

c) Consider the following processes where Arrival and Burst time are as shown below : **6**

Process	Burst Time	Arrival Time
P1	05	0
P2	04	2
P3	07	3
P4	06	5

Calculate the Average Waiting Time and Average Turn-around Time if the processes are scheduled using FCFS.

5. a) List the design issues for paging systems and explain any 2. **6**

b) Consider the following Page reference string : 8, 1, 3, 5, 3, 1, 4, 8, 5, 7, 1, 2. The number of page frames = 3, calculate the page faults and the hit ratio for First In First Out Page replacement algorithm. **6**

c) Explain the types of fragmentation and ways to reduce them. **4**

OR

6. a) Write the difference between paging and segmentation. **6**

b) Consider memory partitions as 100K, 500K, 200K, 300K and 600K in order. How would each of the First fit, Best fit and Worst fit algorithms place the processes of 212K, 417K, 112K and 426K are to be allocated (in order) ? Which algorithm makes the most efficient use of memory. **6**

c) Explain need of demand paging with advantages. **4**

7. a) Explain file attributes and the file operations. **6**

b) Explain Linux EXT 2 file system with diagram. **6**

c) Explain I/O software layers. **4**

OR

8. a) Write short note on RAID Disk and CD. **6**

b) Explain the directory system with diagram and directory operations. **6**

c) Explain the need of EXT 3 over EXT 2 file system of Linux. **4**

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[4658] – 562

Seat No.	

T.E. (E&TC) (Semester – I) Examination, 2014
DIGITAL COMMUNICATION
(2012 Pattern)

Time : 3 Hours Max. Marks : 70

Instructions : *1) Answer Q. **1** or Q. **2,** Q. **3** or Q. **4**, Q. **5** or Q. **6**, Q. **7** or Q. 8.*
*2) **Neat** diagrams must be drawn **wherever** necessary.*
*3) Figures to the **right** side indicate **full** marks.*

1. a) Explain the flat-top sampling with functional diagram. Draw spectral diagram for the flat-top sampled signal and aperture effect. **8**

   b) With the help of neat schematic, explain early-late synchronizer. **6**

   c) A voltage V(t) which is a Gaussian Ergodic Random process with a mean of zero and a variance of 4 volt^2, is measured by a dc meter, a true RMS meter and a meter which first squares V(t) and then reads its dc component. Find the output of each meter. **6**

OR

2. a) Explain with neat schematic and mathematical analysis, a transmitter and receiver for DPCM. **8**

   b) Derive the expression for power spectral density of polar NRZ signal. **6**

   c) Define Random process. Explain various time averages associated with the random process. **6**

3. a) Derive the expression of SNR for integrator and dump filter and explain working of integrator and dump filter. **8**

   b) Explain Gram - Schmit procedure for orthogonalization. **8**

OR

4. a) Derive the expression of probability error (Pe) for matched filter. **8**

   b) Find decision threshold if conditional probability density functions after addition of noise are of Gaussian distribution and voltage V_1 represents symbols S_1 and V_2 symbol S_2 for noise case, show the threshold when apriori probabilities are equal and unipolar signal $V_1 = +V$ and $V_2 = 0$. **8**

P.T.O.

5. a) In a digital communication system, the bit rate of NRZ data stream is 5Mbps and carrier frequency of transmission is 100 MH_2. Find. **9**
   a) Mathematical equation
   b) Symbol rate
   c) Band width
   for the following modulation schemes.
   i) BPSK
   ii) QPSK
   iii) 16-ary PSK.

   b) Draw the block diagram of DPSK transmitter and explain its operation with proper waveforms. **6**

   c) Explain the concept of OFDM. **3**

OR

6. a) Given the input binary sequence 1100100010, sketch the waveforms of the in-phase and quadrature components of a modulated wave obtained by using the QPSIC scheme. **9**

   b) Compare BPSK, QPSK and M'ary PSK with the help of equations, signal space representation, symbol rate and bandwidth. **9**

7. a) A spread spectrum system has the following parameters. **6**

   Information bit duration $T_b = 4.095$ m sec.

   PN chip duration $T_c = 1\,\mu$ sec.

   Find the processing gain. What is the number of shift registers required ? Also find the jamming margin if the $\frac{Eb}{No} = 10$ for the BPSK scheme.

   b) Draw block diagram of DSSS - PSK transmitter. **2**

   c) What are the properties of maximal length sequences ? Give the graphical representation of auto correlation property of random data and a PN sequence and explain. **8**

OR

8. a) Draw and explain FHSS spread spectrum system with transmitter and receiver section. **8**

   b) Explain various wireless standards for Wi - Fi and Wi Max. **4**

   c) Write short note on Personal Communication Systems (PCS). **4**

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Seat No.	

T.E. (Electronics and Telecommunication) (Semester – I) Examination, 2014
ELECTROMAGNETICS AND TRANSMISSION LINES
(2012 Course)

Time : 3 Hours Max. Marks : 70

***Instructions** : 1) Answer Q. No. **1** or Q. No. **2**, Q. No. **3** or Q. No. **4**, Q.No. **5** or Q. No. **6**, Q. No. **7** or Q. No. **8** and Q. No. **9** or Q. No. **10**.*

*2) Figures to **right** indicate full marks.*

*3) Neat diagram must be drawn **wherever** required.*

*4) **Use** of Electronic Pocket Calculator and Smith Chart is **allowed**.*

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

1. a) Derive expression for electric field intensity due line charge using Gauss law. **6**

   b) Derive expression for capacitance of parallel plate capacitance. **4**

   OR

2. a) Derive expression for electric field intensity due sheet charge using Gauss law. **6**

   b) Explain polarization in dielectrics. **4**

3. a) Explain the physical significance of Curl. **4**

   b) Given the potential function V = 4x + 2y V in free space, find the stored energy in 1 m^3 volume centered at the origin. **6**

   OR

4. a) Define conduction current and conduction current density and hence derive current Continuity equation. **6**

   b) State and explain Biot and Savart law. **4**

5. a) Write Maxwell's equations for static and time varying fields in point and integral forms. **8**

   b) In the material for which $\sigma = 6\ S/m$, $\in_r = 2.5$. The electric field intensity $E = 250\ Sin\ (10^{10}t)$ V/m. Find the conduction and displacement current densities and the frequency at which both have equal magnitudes. **8**

   OR

P.T.O.

6. a) State and Prove Poynting theorem. Interpret each term. **8**

   b) $\mu = 10^{-5}$, $\varepsilon = 4 \times 10^{-9}$, $\sigma = 0$ and $\rho_v = 0$. Find K so that each of the following pairs of fields satisfy Maxwell's equations

      i) $D = 6\hat{a}_x - 2y\hat{a}_y + 2z\hat{a}_z \, nC/m^2$

      $H = kx\hat{a}_x - 10y\hat{a}_y - 25z\hat{a}_z \; A/m$

      ii) $E = (20y - Kt)\hat{a}_x$ and $H = (y + z \times 10^{-6} t)\hat{a}_z$. **8**

7. a) State primary and secondary constants of a transmission line and hence derive relationship between primary and secondary constants of transmission line. **8**

   b) A transmission line has characteristic impedance of 50 ohm. Find the reflection coefficient if line is terminated with
      1) 50 Ohm
      2) 0 Ohm
      3) 75 + j75 Ohm
      4) 75 + j 40 Ohm. **8**

OR

8. a) Explain the phenomenon of reflection on transmission line and reflection coefficient. **8**

   b) Write the equations for voltage and current at any point along the length of transmission line and hence explain physical significance of general solution of transmission line. **8**

9. a) What do you mean by distortion less line ? Derive the expressions for characteristic impedance and propagation constant for distortion less line. **8**

   b) A loss less transmission line with characteristic impedanc 50 ohm is 30 m long and operates at 2 MHz. The line is terminated with a load of (60 + j40). If phase velocity is 0.6 c. where c is speed of light then find using Smith Chart.
      1) Reflection Coefficient
      2) The standing wave ratio
      3) The input impedance. **10**

OR

10. a) Explain what do you understand by standing waves and standing wave voltage ratio and hence derive the expression for input impedance of line in terms of characteristic impedance and propagation constant. **10**

    b) A transmission line operating on 100 MHz has $Z_0 = 60$ ohm, attenuation constant 0.02 Np/m and phase velocity is 0.6 c where c is speed of light in vacuum. Find the line parameters R, L, G and C. **8**

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Seat No.	

T.E. (Instrumentation and Control) (Semester – I) Examination, 2014
CONTROL SYSTEM COMPONENTS
(2012 Course)

Time : 3 Hours Max. Marks : 70

Instructions : *i) Students have to answer **5** questions.*
*ii) Answer Q. **1** or Q. **2,** Q. **3** or Q. **4,** Q. **5** or Q. **6,** Q. **7** or Q. **8,** Q. **9** or Q. **10**.*
*iii) **Neat** diagrams must be drawn **wherever** necessary.*
*iv) Figures to the **right** side indicate **full** marks.*
*v) Assume suitable data if **necessary**.*

1. a) Explain in brief the application of thumbwheel switch. **4**
   b) List different types of special pneumatic cylinders. Explain any one type. **6**

OR

2. a) State the advantages and limitations of Electromechanical Relay. **5**
   b) Draw pneumatic circuit for implementing Automatic reciprocation of double acting cylinder. **5**

3. a) Explain the advantages and layout in a typical Motor Control Centre. **5**
   b) Draw using standard symbols pneumatic circuit for speed control of single acting cylinder only in forward direction. **5**

OR

4. a) Draw electrical wiring diagram using standard symbols for star delta starter. **5**
   b) What purpose does a FRL serve in a pneumatic system ? Explain with the help of a neat figure the working of lubricator. **5**

5. a) Explain with the help of neat block diagram hydraulic supply. **8**
   b) An 8 inch bore hydraulic cylinder has a $5\frac{3}{8}$ inch diameter piston rod. Develop using standard symbols a hydraulic circuit to develop equal forces while extending and retracting. **10**

OR

6. a) Compare hydraulic systems with electrical systems. **8**
   b) With the help of standard symbols draw hydraulic circuit for sequential operation of 2 cylinders. **10**

P.T.O.

7. a) Explain the front panel controls of a typical alarm annunciator. **8**

   b) With the help of neat figure explain any one application of synchro in detail. **8**

OR

8. a) Explain the need of the following auxiliary components.

      a) High selector

      b) Seals **8**

   b) Write the differences between a circuit breaker and fuse. **8**

9. a) Explain any two fluidic gates. **8**

   b) Define hazardous area/location and give its classification. **8**

OR

10. a) Explain fluidic elements used as sensors. **8**

    b) Explain various methods to make an instrument safe in hazardous area. Explain the concept of any one method. **8**

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[4658] – 574

Seat No.	

T.E. (Instrumentation and Control) (Semester – I) Examination, 2014
CONTROL SYSTEM DESIGN
(2012 Course)

Time : 3 Hours Max. Marks : 70

***Instructions** : 1) Solve Que.**1** or **2**, Que. **3** or **4**, Que. **5** or **6**, Que. **7** or **8**, Que. **9** or **10**.*
*2) **Neat** diagrams must be drawn **wherever** necessary.*
*3) Figures to the **right** indicate **full** marks.*
*4) **Use** of non-programmable calculator is **allowed**.*
*5) Assume suitable data, **if necessary**.*

1. a) An open loop transfer function of unity feedback system is

$$G(s)\,H(s) = \frac{K}{(s+p_1)(s+p_2)}.$$

If we add one pole in the system at $s = -p_3$, explain its effect on the root locus and closed loop transient response of G(s)H(s). **4**

b) A closed loop transfer function of a first order plant with proportional controller K_c is

$$\frac{y(s)}{r(s)} = \frac{K_pK_c}{T_ps + 1 + K_pK_c}$$

where y(s) is plant output, r(s) reference input and K_p plant gain. For step change in r(s), show that

$$\text{offset} = \frac{1}{1+K_pK_c}.$$ **6**

OR

2. a) With the help of magnitude and phase plot explain, Lead, Lag and Lead-Lag compensator. **6**

b) A closed loop transfer function of a integrating plant (1/As) with proportional controller K_c is

$$\frac{y(s)}{r(s)} = \frac{1}{\frac{A}{K_c}s + 1}.$$

where y(s) is plant and r(s) is reference input. For step change in r(s), show that offset = 0. **4**

P.T.O.

3. a) Write your comments on effects of proportional only controller for a first order plant. **4**

   b) A first order plant has a transfer function

   $$G_p(s) = \frac{K_p}{T_p s + 1}$$

   and required closed output trajectory is

   $$\frac{1}{T_r s + 1}.$$

   Determine the controller using direct synthesis. **6**

   OR

4. a) Write your comments on effects of Integral only controller for a first order plant. **4**

   b) A plant has a transfer function

   $$G_p(s) = \frac{5}{s(s+1)}.$$

   Design a PD controller so that damping factor such that closed loop pole is located at $s = -1.2 + j1.2$. **6**

5. a) The state space model is

   $$\dot{x} = Ax + Bu$$

   $$y = Cx + Du$$

   Determine the expression for transfer function model. **6**

   b) Determine the state space model in controllable canonical form for a transfer function given as $G(s) = \frac{s+2}{(s+1)(s+3)(s+4)}$. **10**

   OR

6. a) Define the following term :
   - State Variables
   - State Space **4**

   b) The state space model is

   $$\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \\ \dot{x}_3 \end{bmatrix} = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ -2 & -3 & -4 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} + \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix}$$

   $$y = \begin{bmatrix} 1 & 0 & 0 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix}$$

   Determine the transfer function model. **12**

7. a) The state space model is

$$\begin{bmatrix}\dot{x}_1\\ \dot{x}_2\end{bmatrix}=\begin{bmatrix}0 & 1\\ -3 & -4\end{bmatrix}\begin{bmatrix}x_1\\ x_2\end{bmatrix}+\begin{bmatrix}0\\ 1\end{bmatrix}$$

$$y=\begin{bmatrix}3 & 2\end{bmatrix}\begin{bmatrix}x_1\\ x_2\end{bmatrix}$$

Determine the state transition matrix using matrix diagonalization (using Van-dermonde's matrix) method. **10**

b) The state space model is

$$\begin{bmatrix}\dot{x}_1\\ \dot{x}_2\end{bmatrix}=\begin{bmatrix}0 & 1\\ -5 & -4\end{bmatrix}\begin{bmatrix}x_1\\ x_2\end{bmatrix}+\begin{bmatrix}0\\ 1\end{bmatrix}$$

$$y=\begin{bmatrix}3 & 2\end{bmatrix}\begin{bmatrix}x_1\\ x_2\end{bmatrix}$$

Determine the controllability and observability of the system. **8**

OR

8. Determine the output time response for the state space model given below

$$\begin{bmatrix}\dot{x}_1\\ \dot{x}_2\end{bmatrix}=\begin{bmatrix}0 & 1\\ -3 & -4\end{bmatrix}\begin{bmatrix}x_1\\ x_2\end{bmatrix}+\begin{bmatrix}0\\ 1\end{bmatrix}$$

$$y=\begin{bmatrix}1 & 2\end{bmatrix}\begin{bmatrix}x_1\\ x_2\end{bmatrix}$$

$u = 1$ for $t \geq 0$ initial conditional is

$$x(0)=\begin{bmatrix}1 & 0\end{bmatrix}^T.$$

18

9. The transfer function model of the system is

$$\frac{1}{s^2+3s+2}$$

It is desired to place the system closed loop poles at $s_1 = -1$ and $s_2 = -2$. Determine state feedback gain matrix using Ackerman's method. **16**

OR

10. The transfer function model of the system is

$$\frac{1}{s^2+5s+6}$$

It is desired to place the observer poles at $s_1 = -3$ and $s_2 = -2$. Determine state observer gain matrix using Ackerman's method. **16**

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Seat No.	

T.E. (Chemical Engineering) (Semester – I) Examination, 2014
CHEMICAL ENGINEERING THERMODYNAMICS – II
(2012 Course)

Time : 3 Hours Max. Marks : 70

Instructions : *1) Answer Q. **1** or Q. **2**, Q. **3** or Q. **4**, Q. **5** or Q. **6**, Q. **7** or Q. **8**, Q. **9** or Q. **10.***
*2) Neat diagrams must be drawn **wherever** necessary.*
*3) Figures to the **right** side indicate **full** marks.*
*4) Assume suitable data if **necessary**.*

1. Show that the fugacity of gas obeying the Van der Walls equation of state is given by **10**

$$\ln f = \frac{b}{V-b} - \frac{2q}{RTV} + \ln \frac{RT}{V-b}$$

where a and b are Van der Walls constants.

OR

2. Calculate the partial molar volumes of methanol and water in 40% (mol) methanol solution give the following data at 1 bar and 298 K. (x = mole fraction of methanol). **10**

X	0	0.114	0.197	0.249	0.495	0.692	0.785	0.892	1.0
VX 10^3 m^3/mol	0.0181	0.0203	0.0219	0.023	0.0283	0.0329	0.0352	0.0379	0.0407

3. The volume of mixture of two organic liquids 1 and 2 is given by **10**

$$V = 110.0 - 17\,x_1 - 2.5\,x_1^2$$

where V is the volume in m^3/mol at 1.0 bar and 300 K. Find the expression for $\overline{V1}, \overline{V2}$ and ΔV.

OR

4. a) A vessel is divided into two compartments. One contains 100 moles nitrogen at 298 K and 1 bar and the other contains 100 moles of oxygen at the same conditions. The barrier separating them is removed and the gases are allowed to reach equilibrium under adiabatic conditions. What is the change in entropy of the contents of the vessel ? **5**

b) Methanol (1)-acetone (2) system is described by the Van Laar activity coefficient model. At 60°C, the model parameters are $A_{12} = 0.47$; $A_{21} = 0.78$. Estimate the activity coefficients for a solution containing 10 mole% of methanol. **5**

P.T.O.

5. a) The azeotrope of the ethanol-benzene system has a composition of 44.8% (mol) ethanol with a boiling point of 341.4 k at 101.3 KPa. At this temperature the vapor pressure of ethanol is 68.9 KPa and the vapor pressure of ethanol is 67.4 KPa. What are the activity coefficient in a solution containing 10% alcohol ? **10**

b) Using the criterion of phase equilibrium show that the osmotic pressure over an ideal solution can be evaluated as $P_{osmotic} = \frac{RTX_a}{V_b}$

where X_a is the mole fraction of solute and V_b is the molar volume of the solvent. **8**

OR

6. a) The vapour pressure of acetone acetonitrile and nitromethane can be represented by antoine equation as **10**

$$\ln P_1^{sat} = 14.3916 - \frac{2795.82}{T + 230}$$

$$\ln P_2^{sat} = 14.2724 - \frac{2945.47}{T + 224}$$

$$\ln P_3^{sat} = 14.2043 - \frac{2972.64}{T + 209}$$

where P_{1sat}, P_{2sat} and P_{3sat} are KPa and T is in °C. Assuming that the solutions formed by these are ideal, calculate

i) P and y_1 at T = 75°C, x_1 = 0.30 x_2 = 0.40

ii) P and x_1 at T = 80°C, y_1 = 0.45, y_2 = 0.35

b) Derive various criteria for phase equilibrium. **8**

7. a) n-Butane is isomerized to i-butane by the action of catalyst at moderate temperatures it is found that the equilibrium is attend at the following composition. **8**

Temperature, K	**Mole%, n-butane**
317	31.00
391	43.00

Assuming that activities are equal to the mole function calculate the standard free energy of the reaction at 317 K and 391 K and average value heat reaction over this temperature range.

b) Derive Van't Hoff equation. **8**

OR

8. a) In, a laboratory investigation, acetylene is catalytically hydrogenated to ethylene at 1120°C and 1 bar. If the feed is an equimolar mixture of acetylene and hydrogen, what is the composition of the product stream at equilibrium ? **8**

   Reactions :

   $$C_2H_2 \longrightarrow 2C + H_2 \quad (I)$$

   $$2C + 2H_2 \longrightarrow C_2H_4 \quad (II)$$

   b) Derive the relationship between mole fraction of species in multiple reactions and the extent of reactions. **8**

9. a) Explain phase rule and Duhem's theorem for reacting system. **8**

   b) What is Fuel cell ? Show that work obtainable from the electrochemical device is equal to change in Gibbs free energy change. **8**

   OR

10. A mixture of 1 mol CO, and 1 mo, water vapour is undergoing the water-gas shift reaction at a temperature of 1100 K and a pressure of 1 bar. **16**

    $$CO_{(g)} + H_2O_{(g)} \longrightarrow CO_{2(g)} + H_{2(g)}$$

    The equilibrium constant for the reaction is K = 1. Assume that the gas behaves as ideal gas. Calculate

    A) The fractional dissociation of steam

    B) The fractional dissociation of steam if CO supplied is 100% excess of the stoichiometric requirement.

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[4658] – 591

Seat No.	

T.E. (Computer) (Semester – I) Examination, 2014
DATABASE MANAGEMENT SYSTEMS APPLICATIONS
(2012 Course)

Time : 3 Hours Max. Marks : 70

Instructions : *1) Answer Q. **1** or Q. **2**, Q. **3** or Q. **4**, Q. **5** or **6**, Q. **7** or Q. **8**, Q. **9** or Q. **10**.*
*2) **Neat** diagrams must be drawn **wherever** necessary.*
*3) Figures to the **right** side indicate **full** marks.*
*4) Assume suitable data, if **necessary.***

1. a) Design E-R model for Online Book Shop Database System **5**
   i) List the entity sets and their primary keys
   ii) Extend the E-R diagram, using Specialization.
   b) Define normalization. Explain three normal forms with suitable example. **5**

OR

2. a) Explain MongoDB CRUD operations with suitable example. **5**
   b) Consider following relational tables **5**

   instructor (ID, name, dept_name)

   student (ID, dept_name, tot_cred)

   takes (ID, course_id, sec_id, semester, year)

   course (course_id, title, dept_name, credits)

   Dept (Dept_id, dept_name)

   Solve following quries using SQL

   i) Design above relation tables using SQL DDL statements, primary key and foreign key

   ii) Find the names and average salaries of all departments whose average salary is greater than 42000.

3. a) Explain distinct between the terms serial schedule and serializable schedule with suitable example. **5**
   b) Explain aggregation using MongoDB with suitable example. **5**

OR

P.T.O.

4. Write a short note on **(any two)** : **10**
   i) Croude sourcing
   ii) Two phase locking protocol
   iii) Query optimization in NoSQL.

5. a) Explain 2-tier and 3-tier architecture with diagram for online Banking Database system. **5**
   b) Explain any two parallel Database System Architecture in detail. **5**
   c) If we are to ensure atomicity, all the sites in which a transaction T executed must agree on the final outcome of the execution T must either commit at all sites, or it must abort at all sites. Describe the Two Phase Commit Protocol used to ensure this property in detail. **7**

OR

6. a) Compare homogeneous and heterogeneous distributed databases. **5**
   b) Explain Cassandra database in detail. **5**
   c) Explain database connectivity using MongoDB with suitable example. **7**

7. a) What is JSON ? Explain JSON schema with example. **5**
   b) What is HBase ? Explain data models in detail. **5**
   c) Consider bibliography database system for different database entities such as book, book year, author, editor, title, publisher, price etc. **7**
   Design XML DTD with Constraints for Bibliography Database System.

OR

8 a) Explain XPath and Xquery with suitable example. **5**
   b) Explain HIVE database in detail. **5**
   c) Explain different components of Hadoop in details. **7**

9. a) Explain BIS components in detail. **5**
   b) Compare operational system and data warehouse. **5**
   c) Define clustering. Explain any clustering algorithm with suitable example. **6**

OR

10. a) Explain Data Mining classification task with suitable example. **5**
   b) Define Machine Learning. Explain supervised and unsupervised learning with suitable example. **5**
   c) Explain Data Warehouse Architecture in detail. **6**

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[4658] – 593

Seat No.	

T.E. (Computer) (Semester – I) Examination, 2014
COMPUTER FORENSIC AND CYBER APPLICATIONS
(2012 Course)

Time : 3 Hours Max. Marks : 70

***Instructions** : 1) Solve Q. **1** or Q. **2**, Q. **3** or Q. **4** , Q. **5** or Q. **6**, Q. **7** or Q. **8**.*
*2) **Neat** diagrams must be drawn **whenever** necessary.*
*3) Assume suitable data if **necessary**.*
*4) Figures to the **right** indicate **full** marks.*

1. a) Explain following network hardware components **8**
   1) Hub
   2) Repeater
   3) Switch
   4) Router

   b) What are different digital investigation process models ? Describe any one. **6**

   c) Explain how intruders make use of social engineering and reverse social engg. to achieve their motive. **6**

OR

2. a) Explain periodic listen and sleep operation in S-MAC. **8**

   b) Explain evidence exchange principle with neat diagram. **6**

   c) Write short note on investigative reconstruction in violent crime. **6**

3. a) Define cyber stalking and explain how cyber stalkers operate. **8**

   b) Explain the following terms with respect to reconstruction. **8**
   i) Functional Analysis
   ii) Relational Analysis

OR

4. a) Explain the following terms. **8**
   i) Private key encryption
   ii) Public key encryption

   b) Write short note on
   i) File formats and carving **8**
   ii) Digital stratigraphy

P.T.O.

5. a) Describe NTFS file system. **8**

   b) Explain how to handle mobile devices as source of evidence. **8**

OR

6. a) Describe unix file system. **8**

   b) Explain in brief Intellectual Property Rights (IPR). **8**

7. a) Explain E-mail forgery and tracking in detail. **9**

   b) Write short note on
      i) Online anonymity and self-protection. **9**
      ii) Searching and tracking on IRC.

OR

8. a) Differentiate between static IP address and dynamic IP address. **6**

   b) Explain different logs in TCP/IP related digital evidence. **9**

   c) Enlist seven main services provided by internet. **3**

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Seat No.	

T.E. (Computer) (Semester – I) Examination, 2014
OPERATING SYSTEM DESIGNS
(2012 Course)

Time : 3 Hours Max. Marks : 70

1. A) Explain the race condition in assigning inodes. **4**

   B) Explain in detail monolithic kernel and micro kernel. **6**

   OR

2. A) Elaborate on the following algorithms in brief (any two). **8**

   1) iget 2) ifree 3) namei 4) getblk.

   B) What is system call ? **2**

3. A) Describe the structure of a regular file with proper diagrammatic representation. **6**

   B) What is TLB ? Why it is used ? **4**

   OR

4. A) Explain the concept of a region. What does the region table entry consists of ? **4**

   B) If the Page address stream is {2, 3, 2, 1, 5, 2, 4, 5, 3, 2, 5, 2}, and frame size is 3. Identify the page faults occurred using FIFO, LRU. **6**

5. A) Explain IPC mechanisms used in System V. **8**

   B) What is socket ? Write and explain an algorithm to transfer data between two computers using socket. **8**

   OR

6. A) What is semaphore ? Provide solution to producer-consumer problem using semaphore. **8**

   B) Explain in detail shared memory and message passing along with their system calls. **8**

7. A) What is AWK scripting ? Write an AWK script to print squares of numbers from 1 to 10. **8**

   B) Explain in detail how to make USB bootable with any open source tool/utility ? **8**

   OR

P.T.O.

8. A) What is secure boot ? State the difference between BIOS and UEFI. **8**

   B) What is make utility ? Explain it with example. Consider your own makefile. **8**

9. A) Draw and explain Android OS architecture. **6**

   B) Explain static table-driven approach for real time scheduling. **6**

   C) Write short notes on : 1) Fail soft operation 2) Frame of references. **6**

OR

10. A) Explain the design issues of multiprocessor scheduling. **6**

    B) Compare hard, soft and firm real time systems. **6**

    C) Write a note on handheld devices. List various OS used for handheld devices. **6**

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[4658] – 602

Seat No.	

T.E. (Information Technology) (Semester – I) Examination, 2014
SOFTWARE ENGINEERING
(2012 Course)

Time : 3 Hours Max. Marks : 70

Instructions *: 1) Answer Q.* ***1*** *or Q.* ***2****, Q.* ***3*** *or Q.* ***4****, Q.* ***5*** *or Q.* ***6****, Q.* ***7*** *or Q.* ***8****, Q.* ***9*** *or Q.* ***10****.*
2) ***Neat*** *diagrams must be drawn* ***wherever*** *necessary.*
3) Figures to the ***right*** *side indicate* ***full*** *marks.*
4) Assume suitable data if ***necessary****.*

1. a) Define software . Compare software and hardware based on their failure curves. **5**
   b) Software engineering process framework activities are complemented by which umbrella activities ? How do process models differ from one another ? **5**

OR

2. a) Discuss agility principles used in agile software development. **5**
   b) Compare scripted testing verses exploratory testing. **5**
3. a) Describe the IEEE template for eliciting software requirement specifications. What information is produced as a consequence of requirements gathering ? **5**
   b) What do you need to know in order to develop an effective use case ? Describe a standard use case documentation template. **5**

OR

4. a) What are different approaches or elements of a requirement analysis model ? **5**
   b) What is the INVEST model of agile requirements gathering ? **5**
5. a) What are the software design quality attributes and quality guidelines ? **8**
   b) Explain any two software architectural styles. **8**

OR

6. a) Give a brief overview of important software design concepts that span both traditional and object-oriented software development. **12**
   b) Why is software architecture important ? **4**
7. a) Explain the Seeheim model of human-computer dialog management. **8**
   b) How do you deal with different stereotypes of users in information gathering phase of user-centered design ? **8**

OR

P.T.O.

8. a) Explain mechanisms applied in user interface design for fulfilling Theo Mandel's three golden rules. **12**

   b) What is Fitt's Law ? How is it used in UI design ? **4**

9. a) Explain the cleanroom process model. **10**

   b) How do we certify a software component during cleanroom testing ? **8**

OR

10. Write short notes on following : **18**

   a) Elements of a Configuration Management System

   b) Test Driven Development Process

   c) Technology Evolution.

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[4658] – 603

Seat No.	

T.E. (Information Technology) (Semester – I) Examination, 2014
COMPUTER NETWORK TECHNOLOGY
(2012 Course)

Time : 3 hours Max. Marks : 70

***Instructions** : 1) Neat diagrams must be drawn **wherever** necessary.*
*2) Black figures to the **right** indicate **full** marks.*
3) Your answers will be valued as whole.
*4) Assume suitable data, if **necessary**.*

1. a) Explain parameters for quality of service in network layer. **6**
   b) State special IP addresses and the private IP addresses. **4**

OR

2. a) Calculate the following for a network address 192. 168. 1. 0127
      a) No. of valid subnets
      b) No. of actual hosts per subnet
      c) Network and broadcast address for each subnet. **6**
   b) Explain TCP header format. **4**
3. a) Explain how to achieve reliability at transport layer. **4**
   b) Explain all socket primitives used by client. **6**

OR

4. a) Differentiate FTP and TFTP. **4**
   b) What is the purpose of SMI and MIB in relation to SNMP. **6**
5. a) Explain architecture of Blue tooth. **10**
   b) Explain frame format of 802.16 **8**

OR

6. a) Describe MAC layer mechanism of IEEE 802.11 **10**
   b) Compare Ethernet and wireless networks. **8**

P.T.O.

7. a) List different routing protocols used by WSN with examples. **8**

   b) Explain set up phase and steady state phase of of LEACH protocol. **8**

OR

8. a) List any six applications of sensor network. **8**

   b) Explain following terms. **8**
      i) Data aggregation
      ii) Data diffusion
      iii) Data dissemination

9. a) Discuss different addresses and identifiers in WSN. **8**

   b) Explain Geographic routing in WSN. **8**

OR

10. a) Write short notes on (**any 2**). **16**
      i) DSR
      ii) BYOD
      iii) Content Based routing.

[4658] – 604

Seat No.	

T.E.(Information Technology)(Semester – I) Examination, 2014
WEB ENGINEERING AND TECHNOLOGY
(2012 Course)

Time : 3 Hours Max. Marks : 70

***Instructions** : 1) Answer Q**1** or Q**2**, Q**3** or Q**4**, Q**5** or Q**6**, Q**7** or Q**8**, Q**9** or Q**10**.*
*2) **Neat** diagrams must be drawn **wherever** necessary.*
*3) Figures to the **right** side indicate **full** marks.*
*4) Assume suitable data if **necessary**.*

1. a) What are main organizational challenges to develop a web site ? **5**
   b) What is world wide web ? With the help of the diagram discuss the Client-Server Structure of the web. **5**

OR

2. a) Differentiate between HTTP versus FTP. **5**
   b) Explain in detail HTTP protocol, purpose and operation. **5**
3. a) Explain the CSS Box Model. **5**
   b) Explain how Cohesive Organization Systems are created. **5**

OR

4. a) Give the list with definition of HTML components. How CSS can be used to change the view ? **5**
   b) Identify the various servers used in internet communication. **5**
5. a) Write a PHP script to display the squares and cubes of 1 to 10 numbers. **8**
   b) What are the advantages of PHP over other scripting languages ? **8**

OR

6. a) List and explain various features of PHP. **8**
   b) What is session ? List the session tracking techniques. How cookies are used to track a session ? **8**
7. a) Compare and contrast HTML and XML showing their capabilities, limitations. **8**
   b) Explain the term Document Type Definition (DTD) with the help of suitable examples. **8**

OR

8. a) What is a servlet ? How do servlets work ? **8**
   b) What are the advantages and disadvantages of servlets ? **8**

P.T.O.

9. a) What accessibility guidelines should be followed while creating websites for individuals ? **9**

   b) List and explain detail website deployment procedure. **9**

OR

10. a) What is WordPress Caching and Why is it important ? **9**

    b) Compare and contrast CMS development tools Drupal and Joomla. **9**

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Seat No.	

T.E. (Electrical) (Semester – I) Examination, 2014
MICROCONTROLLER AND ITS APPLICATIONS
(2008 Course)

Time : 3 Hours Max. Marks : 100

N.B. *: i) Answer **three** questions from Section **I** and **three** questions from Section **II**.*
*ii) Figures to the **right** indicate **full** marks.*
*iii) Assume suitable data, if **necessary**.*

SECTION – I

1. a) Classify the microcontrollers based on number of bits, memory architecture, instruction set, memory devices and family. **8**

   b) Explain the internal RAM structure of 8051 microcontroller. Also explain Programme memory and Data Memory with use of $\overline{EA}$ Pin. **10**

   OR

2. a) Draw and explain Architecture of 8051 Microcontroller and hence explain Memory Organization of 8051. **10**

   b) Explain PSW in 8051. What are the flags that associate with ALU operation in 8051 ? **8**

3. a) Square the content of R4 and put the result in R3 (higher byte) and R2 (lower byte). Also send result at External Location 20h (higher byte) and 21h (lower byte). **8**

   b) Explain stack organization and enlist stack related instructions. **8**

   OR

4. a) Add the content of RAM locations 20h – 30h. Store the result at 40h (lower byte) and 41h (higher byte). **8**

   b) Random numbers are present at R0 to R5. Find largest number and put it in R6. **8**

5. a) Write a program for the 8051 to transfer letter 'A' serially at 4800 baud rate continuously. Also explain SCON register. **10**

   b) Explain SPI communication bus. **6**

   OR

P.T.O.

6. a) What is interrupt ? Hence explain Programming interrupts, Timer interrupts, External interrupts, Serial interrupts and multiple interrupts. **10**

   b) Explain 12C communication bus. **6**

SECTION – II

7. a) Explain 8051 based Assember, Compiler and Simulator. **8**

   b) Draw and explain the interfacing of 8051 with PC through RS 232. **8**

OR

8. a) Draw and explain the interfacing of 8051 with 8255. **8**

   b) Explain working of cross assembler system for 8051. **8**

9. a) Two stepper motors are interfaced to 8051 through a driver card. The motors are controlled through port 0. The step angle of the motor is 1.8 degree. Draw a schematic diagram and write a program to run both the motors in clockwise direction through an angle of 270 degree. **10**

   b) Write a short note on temperature measurement using 8051. **8**

OR

10. Write a short note on measurements of given physical quantities using 8051

    A) flow measurement

    B) level measurement

    C) humidity measurement. **18**

11. a) Explain frequency measurement using 8051. **8**

    b) Write a short note on 8051 based AC motor control. **8**

OR

12. a) Explain how a 4x4 matrix keyboard can be interfaced with 8051. **6**

    b) Write a short note on 8051 based KVA and KVAR measurement. **10**

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Seat No.	

T.E. (Electronics) (Semester – I) Examination, 2014
NETWORK SYNTHESIS AND FILTER DESIGN
(2008 Course)

Time : 3 Hours Max. Marks : 100

Instructions : *1) Answer to the **two** Sections should be written in **separate** books.*
*2) Answer Q. **1** or Q. **2,** Q. **3** or Q. **4,** Q. **5** or Q. **6,** Q. **7** or Q. **8,** Q. **9** or Q. **10,** Q. **11** or Q. **12**.*
*3) **Use** of Electronic pocket calculator is **allowed**.*
*4) Figures to the **right** side indicate **full** marks.*
*5) Assume suitable data if **necessary**.*

SECTION – I

1. a) Explain in details the testing procedure for positive real function. **6**

   b) Determine whether the following functions are positive real function **8**

   a) $Z(s) = \dfrac{s^2 + 1}{s^2 + 4s}$ b) $Y(s) = \dfrac{5s^2 + s}{s^2 + 1}$

   c) Define all the transfer functions for a two port network. **4**

OR

2. a) What is Hurwitz's polynomial ? State and properties of such polynomial. **6**

   b) Determine whether the polynomial F(s) is Hurwitz

   $F(s) = s^4 + s^3 + 2s^2 + 3s + 2$ **4**

   c) For the network shown in Fig. 1, find the functions $y_{11}(s)$ and $-y_{21}(s)$. **8**

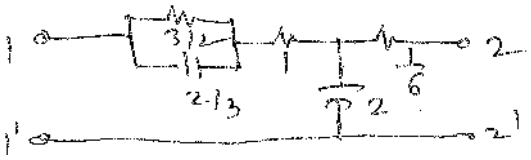

Figure 1

3. a) Synthesize the following one port network function in both foster forms

$$Z(s) = \frac{(s^2 + 1)(s^2 + 9)}{s(s^2 + 4)}$$ **8**

   b) Synthesize the following one port network function in both cauer forms

$$Y(S) = \frac{(s + 1)(s + 3)}{(s + 2)(s + 5)}$$ **8**

OR

P.T.O.

4. a) List properties of one port LC driving point impedance function. **6**

   b) Indicate with reasons which of the following driving point functions are RC, LC or RL. Out of that realize only RL function in both foster forms. **10**

   i) $Z(S) = \dfrac{s^3 + 2s}{s^4 + 4s^2 + 3}$

   ii) $Y(S) = \dfrac{s^2 + 2.5s}{s^2 + 5s + 6}$

   iii) $Y(S) = \dfrac{(s+1)(s+3)}{s\,(s+2)}$

5. a) Explain the concept and significance of zeros of transmission in two port network synthesis. Also, prove that all passive ladder networks have minimum phase transfer function. **8**

   b) Synthesize **8**

   $$Y_{21}(s) = \frac{s^2}{s^3 + 3s^2 + 4s + 2}$$

   as a LC ladder with 1Ω termination.

OR

6. a) Synthesize the all pass function **6**

   $\dfrac{V_o}{V_{in}} = \dfrac{s^2 - 2s + 2}{s^2 + 2s + 2}$ as a lattice network terminated into 1Ω.

   b) Synthesize voltage ratio **6**

   $$\frac{V_2}{V_1} = \frac{s^2 + 1}{s^2 + 2s + 1}$$

   as a constant resistance bridge T network terminated by 1Ω.

   c) Identify the zeroes of transmission for the network in Fig. 2 **4**

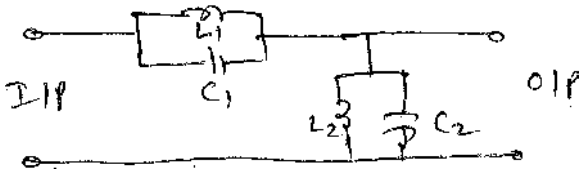

Figure 2

SECTION – II

7. a) Explain the need and concept of magnitude and frequency scaling as used in filter designing. **8**

   b) Realize a third order Butterworth filter given by the transfer impedance function $Z_{21}(s)$, as an LC network with cut off frequency 1 rad/sec and terminated by 1Ω. **8**

OR

8. a) What is necessity of approximation in filter design ? Compare Butterworth and Chebyshev approximation. **8**

   b) Explain in detail the properties of Chebyshev polynomials used in filter approximation. **8**

9. a) Explain the different biquad feedback topologies used in active filter design and list the important observations. **8**

   b) Synthesize a 2nd order low pass filter to have pole frequency of 2 KHz and pole Q of 10 using the Sallen and Key circuit based on positive feedback. **8**

OR

10. a) What is cascade approach in filter design synthesis ? Explain in detail and list its advantages. **8**

    b) Synthesize the given high pass filter function using RC $\rightarrow$ CR transformation

$$H_{HP}(s) = K\frac{s^2}{s^2+s+25}$$ where K is a constant. **8**

11. a) Define sensitivity and its significance. Derive the property of sensitivity,

$$S_x^{y1+y2} = \frac{y_1 s_x^{y1} + y_2 s_x^{y2}}{y_1 + y_2}$$ **6**

    b) Find the transfer function (V_2/V_1) of a passive network shown in Fig. 3. Also compute the sensitivities of K, ω_p and Q_p with respect to elements. **10**

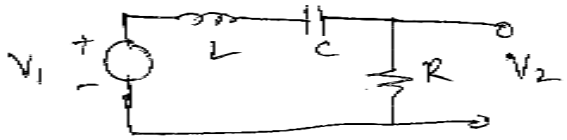

Figure 3

OR

12. a) Describe the properties of op-amp such as dynamic range, slew rate, offset voltage, input bias and input offset currents and common mode signal in contest of filter design. **8**

    b) The transfer function for a passive RLC circuit is described by

$$\frac{v_o}{v_i} = \frac{s}{C\left(s^2 + \frac{s}{RC} + 1/LC\right)}$$. Compute the sensitivity of K, ω_p, and Q_p with respect to the passive elements R, L and C. **8**

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Seat No.	

T.E. (Electronics) (Semester – I) Examination, 2014
MICROCONTROLLERS
(2008 Pattern)

Time : 3 Hours Max. Marks : 100

Instructions : *1) Answer **3** questions from Section – **I** and **3** questions from Section – **II.***
*2) Answers to the **two** Sections should be written in **separate** answer books.*
*3) Neat diagrams must be drawn **whenever** 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) Compare Microprocessor and microcontroller with respect to general architecture and features with example. **8**

   B) Draw internal structure of port 0 of 8051 microcontroller and explain its working. Why external pull up resister is required in port 0 ? **10**

OR

2. A) Explain the various performance measurement of microcontroller. **8**

   B) Interface 4K × 8 program memory (ROM) and 4K × 8 data memory (RAM) using suitable 3 : 8 decoder with an 8051 microcontroller. The ROM address should start at 1000 H and RAM address should follow end address of ROM. Find out number of address lines required for interfacing ROM and RAM, show the memory mapping and show all interface signals. **10**

3. A) What do you mean by term addressing mode ? What are the different addressing modes supported by 8051 ? Describe any three addressing modes with example. **8**

   B) Assume that ROM space starting at 200 H contain string “PUNE”, write an algorithm and assembly language program to transfer the byte in to RAM location at 40 H. **8**

OR

P.T.O.

4. A) List the SFRs associated with the following functions, find out their addresses and their contents after reset : **8**
   i) Timer/Counter
   ii) I/O Ports
   iii) Interrupts
   iv) Serial communication.

   B) Write an assembly language program of 8051, use timer 0 to generate a square wave of 2KHz frequency on pin P1.5. Calculate the value need to store in Timer 0 register. In calculation do not include the overheads due to instruction. **8**

5. A) Draw an interfacing diagram to interface 16 × 2 LCD with 8051 microcontroller and write an assembly language program to display the message 'UNIVERSITY' on first line of LCD in 8 bit mode. Assume LCD commands and data has been stored in lookup table starting address of 300 H. **10**

   B) Draw an interfacing diagram to interface stepper motor through ULN2003 driver to 8051 microcontroller. Explain full step mode and half step mode of stepper motor. **6**

OR

6. A) Assume three LED's as RED, YELLOW and GREEN signals of traffic control system interfaced to port P1.0, P1.1 and P1.2 respectively. Write an Assembly Language program to keep RED LED on for 15 Sec, YELLOW for 5 sec. and GREEN for 10 Sec. Generate the delay using simple loop and show the calculation of delay for 1 sec. **10**

   B) Draw an interfacing diagram for interfacing ADC 0808 with 8051 microcontroller and state the features of ADC0808. **6**

SECTION – II

7. A) Write hardware specifications of RS 232 bus standards. And explain the need of MAX 232 in serial communication. **8**

   B) Explain interrupt vs. polling. Write serial communication program using interrupt in which the 8051 reads data from port p1 and writes it to port p2 continuously while giving a copy of it to the serial port to be transferred serially. Assume that XTAL = 11.0592 MHz, set the baud rate at 9600. **10**

OR

8. A) Write short note on SPI protocol with suitable diagram. **8**

   B) Explain all the conditions of 12C protocol using timing diagram. **10**

9. A) Draw and explain data memory organization of PIC 18Fxxx microcontroller. **8**

   B) Draw an interfacing diagram to interface 8 LEDs with PORT B of PIC 18 Fxxx and write an embedded C program for flashing of all LEDs assume suitable delay. **8**

OR

10. A) Draw and explain status register of PIC microcontroller. **8**

    B) Write a C program for configuring inbuilt ADC of PIC 18Fxxx. Assume analog data is available on channel 0 (RA0) of ADC and display the result on the LEDs which are interfaced on PORTC and PORTD. **8**

11. Design 8051/PIC microcontrollers based system to calculate and display the weight using load cell. **16**

    - Design suitable signal conditioning circuitry.
    - Draw complete interfacing diagram using suitable ADC.
    - Draw the flowchart and write the program in assembly or in C language which includes initialization and peripherals.

OR

12. Design 8051/PIC microcontroller based path follower system using stepper motor. The stepper motor having step angle 7.5°. Use suitable sensors to sense the path. Draw complete interfacing diagram and write function of each device used in system. Write down complete operation of the system and draw flowchart. **16**

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Seat No.	

T.E. (Instrumentation and Control) (Semester – I) Examination, 2014
EMBEDDED SYSTEM DESIGN
(2008 Pattern)

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) Explain the multi function role of Port 3 in 8051. **12**
   b) Explain the use of pin EA in 8051. **6**

OR

2. a) What is SFR ? Explain in brief the SFRs of 8051. **12**
   b) How is data stored or loaded in accumulator from external memory ? **6**
3. a) Write a program to interface a stepper to 8051. **8**
   b) Which SFRs are involved in serial communication of 8051 ? **8**

OR

4. Write a program to interface a 10 bit ADC with 8051. Draw the interface diagram and explain the working of interface with flow chart. **16**
5. An 8051 based tank level control system is to be designed with the control action as on-off. The pump is turned on and off with a relay. Select suitable level sensors for the interface. The level of the tank should be displayed on a 2 digit 7-segment LED display in % and input interface to set the level of tank.
   Draw the interface diagram in detail. **18**

OR

6. With a neat diagram along with flow chart, explain the interfacing of 10 digit DAC to 8051 for an output range of 0 – 10 Volt. **18**

P.T.O.

SECTION – II

7. a) Explain in detail how Analog Comparator works in AT90S2313 microcontroller. **8**

   b) State and explain the alternate function of Port B in AT90S2313 microcontroller. **8**

OR

8. a) How is memory program protected in AT90S2313 microcontroller. **8**

   b) The following is the MCUCR register of ATMega 8535 AVR microcontroller. Explain the bits of this I/O register. **8**

7	6	5	4	3	2	1	0
SM2	SE	SM1	SM0	ISC11	ISC10	ISC01	ISC00

9. a) Explain the I^2C two wire serial interface used with AVR microcontrollers. **8**

   b) Explain the four sources of reset in ATMega 8535 AVR microcontrollers. **8**

OR

10. a) Draw and explain the RISC architecture of AT90S2313 AVR microcontrollers. **8**

    b) Explain the following instruction of AT90S2313 AVR microcontrollers. **8**
       i) LDD
       ii) SWAP
       iii) SES
       iv) BRHC.

11. a) Draw and explain the memory map of AT90S2313 AVR microcontrollers. **8**

    b) Write a program to transfer data stored in R0 to R7 to R20 to R27 of AT90S2313 AVR microcontroller. **8**

OR

12. a) Write a program to read a single ended analog input and store the digital value in any location of EEPROM for ATMega 8535 AVR microcontrollers. **8**

    b) Write a program to convert 2 digit hexadecimal number to BCD number for AT90S2313 AVR microcontrollers. **8**

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Seat No.	

T.E. (Instrumentation & Control) (Semester – I) Examination, 2014
ELECTRONICS INSTRUMENTATION
(2008 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) A black **figure** to the right indicate **full** marks.*

SECTION – I

1. a) How RMS value measurement is done ? Explain with neat block diagram. **8**
   b) Draw the block diagram of basic DMM and explain different types of measurements in DMM with neat diagram. **8**

   OR

2. a) Explain the terms - RMS value and True RMS value. What is True RMS value of sine wave voltage of amplitude $V_P = 4\sqrt{2}$ V superimposed on a DC voltage of $V_{DC} = 3V$? **8**
   b) With the help of proper diagrams, explain how passive components can be measured in LCR-meter. Also explain the "Q" concept in LCR-meter. **8**
3. a) Draw a neat labelled internal block diagram of 8038 and explain in detail. **8**
   b) What is frequency synthesis ? Explain direct synthesis type with a neat block diagram. **8**

   OR

4. a) With neat diagrams explain working of the sine wave converter using resistance-diode shaping circuit. **8**
   b) What is Jitter ? State the different types and the reason of their occurrence with the help of waveforms. **8**
5. a) With a neat block diagram explain the working of sampling Oscilloscope. **10**
   b) Explain different sweep modes in CRO. **8**

   OR

6. a) Explain the following types of probes : **9**
      i) High impedance probe
      ii) Current probe
      iii) High voltage probe.
   b) Explain the Alternate mode and Chop mode with suitable waveforms. **9**

P.T.O.

SECTION – II

7. a) With a neat block diagram explain working of SAR type of ADC. If this ADC is of 3 bit, explain with a diagram, how the analog value of 3 V will be converted. Consider full scale voltage as 8 V. **10**

   b) Elaborate on the following converter specifications : **6**
      i) Accuracy
      ii) Aperture time
      iii) Quantisation Error.

OR

8. a) Draw the block diagrams of Tracking type and Staircase type ADCs. Also compare them (at least 4 points of comparisons are expected). **8**

   b) With a suitable diagram explain the R-2R ladder type DAC. For 8 bit DAC, if input is 11010001, state the expected value and calculated value of the analog output. **8**

9. a) Describe the following modes of universal counter with suitable diagrams : **8**
      1) Totalizing
      2) Time interval
      3) Ratio mode
      4) Period.

   b) Explain application of counter as Digital Frequency Meter. **8**

OR

10. a) Explain the working of Universal counter with the help of a neat block diagram. **8**

    b) Explain in detail-Gating error and Trigger level error in the Universal Counter. **8**

11. a) Explain the concept of Harmonic Distortion. Also explain Fundamental Suppression Harmonic Distortion Analyzer with neat block diagram. **8**

    b) Write short note on : **10**
       i) Virtual Instrumentation Architecture
       ii) THD analyzer.

OR

12. a) Write short notes on : **10**
       1) Spectrum Analyzer with swept frequency technique
       2) Heterodyne wave analyzer.

    b) What is Virtual Instrumentation ? Elaborate with a suitable example. **8**

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