

**B.E /B.Tech (Full time)DEGREE END SEMESTER EXAMINATIONS, April/May 2014**

**MECHANICAL ENGINEERING BRANCH**

**SEVENTH SEMESTER**

**ML 9401-COMPUTER APPLICATIONS IN MATERIAL SCIENCE**

(REGULATIONS 2008)

Time : 3 hr

Max. Marks: 100

Answer ALL Questions

**Part – A ( 10 x 2 = 20 Marks)**

1. Find the root of the equation  $x e^x = 3$  by bisection method?
2. Write the interpolation formula with equal intervals.
3. Classify the following PDE's i)  $y^2 u_{xx} + x^2 u_{yy} = 0$ , ii)  $x^2 u_{xx} - y^2 u_{yy} = 0$ .
4. Write the explicit formula for Parabolic equation .
5. Write the explicit formula for Hyperbolic equation.
6. What are the advantages of Dufort-Frankel method?
7. What is meant by tag numbers?
8. Compare the Gauss Seidel and Gauss Jacobi methods.
9. What is meant by simulation?
10. What are various method of solving a linear system of algebraic equations.

**Part B – ( 5 x 16 = 80 )**

- 11) Discuss briefly the property and modelling of Ferrous materials? (16)
- 12 (a) (i) Find the positive root of the equation  $3x^3 + 5x - 40 = 0$ , correct to two places of decimals, using the bisection method. (8)
- (ii) Find the equation of the cubic curve that passes through the points (-1,-8) (0,3), (2,1) and (3,2) using Lagrange's interpolation formula. (8)

**(OR)**

- (b) (i) Find the Newton-Raphson iterative formula for the reciprocal of a number N and hence find the value of  $1/23$ , correct to 5 places of decimals. (6)

(ii) Solve by Gauss elimination method

$$x + 2y + 3z + 4w = 10$$

$$7x + 10y + 5z + 2w = 40$$

$$13x + 6y + 2z - 3w = 34$$

$$11x + 14y + 8z - w = 64 \quad (10)$$

13(a)(i) Solve the Laplace equation  $U_{xx} + U_{yy} = 0$  from the boundary conditions

i)  $U(x, 0) = 0$ . ii)  $U(x, 4) = 8 + 2x$ . iii)  $U(0, y) = y^2/2$  iv)  $u(4, y) = y^2$ , correct to two places of decimals, by Leibmann's iteration method (16)

(OR)

(b) (i) Solve the equation  $16u_t = u_{xx}$ ,  $0 \leq x \leq 4$ ,  $t > 0$  and  $u(x, 0) = \frac{x(8-x)}{2}$

$U(0, t) = u(4, t) = 8$  and  $h = \frac{1}{2}$  and  $k = 1$  upto 4 time steps using

Dufort Frankel method (16)

14 (a) i) Solve the Poisson equation  $U_{xx} + U_{yy} = -10(x^2 + y^2 + 10)$  over the square mesh having

Sides  $x = 0$ ,  $y = 0$  and  $x = 3$ ,  $y = 3$  with  $u = 0$  on the boundary and length 1 unit correct to one decimal place. (16)

(OR)

b) i) Find the inverse of the matrix by Gauss Jordan method

$$A = \begin{pmatrix} 8 & -4 & 0 \\ -4 & 8 & -4 \\ 0 & -4 & -8 \end{pmatrix} \quad (8)$$

ii) Find the Eigen value by power method where  $A = \begin{pmatrix} -15 & 4 & 3 \\ 10 & -12 & 6 \\ 20 & -4 & 2 \end{pmatrix}$  (8)

15 (a) A sample of 100 arrivals of a customers at a retail sales depot is according to the following distribution.

Arrival time	0.5	1	1.5	2	2.5	3	3.5	4	4.5	5
Frequency	2	6	10	25	20	14	10	7	4	2

A study of time is required to service customers by adding up the bills, receiving payments and placing packages yield following distribution.

Service time	0.5	1	1.5	2	2.5	3
Frequency	12	21	36	19	7	5

Estimate the average percentage the customers waiting time and average percentage of ideal time of the server by simulation for next 10 arrivals. (16)

(OR)

b) i) An automobile production turns out 100 parts a day but deviation occurs for to many cars. The production is more accurately described by the probability distribution given below

Production/day	95	96	97	98	99	100	101	102	103	104	105
Probability	0.03	0.05	0.07	0.10	0.15	0.20	0.15	0.1	0.7	0.05	0.03

Finished products are transported across the bay at the end of the each day by ferry. If the ferry has space for 101 cars , what will be average numbers of cars waiting to be shipped and what will be average number of empty space in the ship ? Calculate it for 15 days? (16)