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B.E /B.Tech DEGREE END SEMESTER EXAMINATIONS, NOV/DEC 2013

MECHANICAL ENGINEERING BRANCH

SEVENTH SEMESTER

ML 9401-COMPUTER APPLICATIONS IN MATERIAL SCIENCE

(REGULATIONS 2008)

Time : 3 hrs

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 P.D.E i) $u_{xx} + 2u_{xy} + u_{yy} = 0$.
ii) $x^2 u_{xx} - y u_{yy} = 0$.
4. When we can use Bender Schimidt method?
5. Write the advantages of Dufort-Frankel method?
6. Write the explicit formula for hyperbolic equation?
7. What is meant by simulation?
8. What is meant by Tag numbers?
9. Compare the Convergence of Gauss Seidel and Gauss Jacobi Method?
10. State Rouché's Theorem?

Part B – (5 x 16 = 80)

- 11) Discuss briefly the property and modelling of Ferrous materials? (16)
- 12 (a) (i) Find the root by $x e^x = 3$ by regular falsi method upto three decimal places. (8)

(ii) Find the derivative of function $f(x)$

X	1	1.2	1.4	1.6	1.8	2.0
f(x)	0	0.128	0.544	1.296	2.432	4

By using Newton forward method.

(8)

(Or)

12 (b) (i) Using Newton-Raphson method solve the following equation

$$e^x = 2x+1 \text{ correct to 4 places of decimals.} \quad (6)$$

(b) (ii) Solve by Gauss Jordan method

$$2x - 4y + 6z + 8w = 9$$

$$6x - 2y + 4z + 10w = 19$$

$$2x + 4y - 5z + w = 15$$

$$4x + 2y - z + 3w = 12 \quad (10)$$

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 4 places of decimals upto seven iterations. (16)

(Or)

(b) 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, correct to three places of decimal units. (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 three decimal place upto 7 seven iterations. (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 $A = \begin{matrix} 1 & -3 & 2 \\ 4 & 4 & -1 \\ 6 & 3 & 5 \end{matrix}$ (8)

15 (a) A sample of 100 arrivals of a customers at a retail sales depotis 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)