Reg. No. : [| | | | | | | | | | | |]

Question Paper Code : 51298

B.E./B.Tech. DEGREE EXAMINATION, APRIL/MAY 2015.

Fifth Semester

Electronics And Communication Engineering

MA 1251 — NUMERICAL METHODS

(Common to Information Technology)

(Regulation 2008)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — ($10 \times 2 = 20$ marks)

1. Obtain the iterative formula by Newton Raphson method for finding $\sqrt{N}$ where N is a positive real number.

2. Using Gaussian elimination method, solve the system of equations $x + 3y = 5$, $2x - y = 3$.

3. What is the Lagrange's interpolation formula to find equation of the curve which passes through the points (x_0, y_0), (x_1, y_1) and (x_2, y_y)?

4. Fit a polynomial from the following data using Newton's forward difference interpolation formula:

x:	0	2	4	6
y:	-1	-1	7	23

5. Write down the formula to get first and second order derivatives using Newton's backward difference at $x = x_n$.

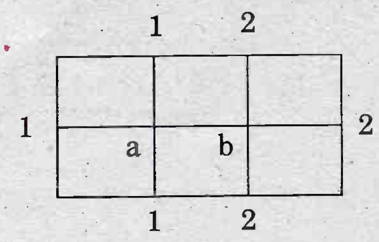
6. State two point Gaussian quadrature formula for integration.

7. Given $y' = x + y^2$ and $y = 1$ at $x = 0$, by using Euler's method, find $y(0.1)$.

8. State Adam-Bashforth predictor-corrector formulae.

9. State implicit finite difference scheme for $\dfrac{\partial u}{\partial t} = a^2 \dfrac{\partial u}{\partial x^2}$.

10. Solve $\nabla^2 U = 0$ numerically for the following square mesh with boundary values as shown in figure



PART B — (5 × 16 = 80 marks)

11. (a) (i) Find the positive real root of $\cos x - 3x + 1 = 0$ by fixed point iterative method, correct to three places of decimals. (8)

(ii) Find the inverse of the matrix by Gauss-Jordan method $\begin{bmatrix} 3 & -3 & 4 \\ 2 & -3 & 4 \\ 0 & -1 & 1 \end{bmatrix}$. (8)

Or

(b) (i) Solve the given system of equations by Gauss-Seidel method

$$x + y + 54z = 110$$

$$27x + 6y - z = 85$$

$$6x + 15y + 2z = 72.$$ (8)

(ii) Find the largest eigenvalue of the matrix $\begin{bmatrix} 1 & 6 & 1 \\ 1 & 2 & 0 \\ 0 & 0 & 3 \end{bmatrix}$ and the corresponding eigenvector by power method. (8)

12. (a) (i) Fit a polynomial for the following data by using divided difference formula:

x:	4	5	7	10	11	13
$f(x)$:	48	100	294	900	1210	2028

Hence find $f(6)$ and $f(12)$. (8)

(ii) For the following data prepare the finite difference table and express y as a function of x, using Newton's backward difference formula and hence find y when $x = 3.25$. (8)

x:	0	1	2	3	4
y:	7	10	13	22	43

Or

(b) Obtain the cubic spline approximation form the following data in the intervals $[2,3]$ and $[3,4]$, given that $y_0'' = y_4'' = 0$

x:	1	2	3	4	5
y:	30	15	32	18	25

Hence find y(2.5) and $y'(3)$. (16)

13. (a) (i) Given the following data, find $y'(6)$. (8)

x:	0	2	3	4	7	9
y:	4	26	58	112	466	922

(ii) Using three point Gaussian quadrature formula, evaluate $I = \int_1^2 \frac{dx}{1+x^3}$. (8)

Or

(b) Evaluate numerically $\int_0^1 \int_1^2 \frac{2xy\, dx\, dy}{(1+x^2)(1+y^2)}$ by taking $\Delta x = \Delta y = 0.25$, using Simpson's 1/3 rule. (16)

14. (a) (i) Using modified Euler's method, compute y(0.1) correct to 4 decimal places given $\frac{dy}{dx} = x + y$ and $y(0) = 1$. (6)

(ii) Apply the fourth order Runge-Kutta method to find $y(0.1)$ given that $\frac{d^2y}{dx^2} + x\frac{dy}{dx} + y = 0,\ y(0) = 1,\ y'(0) = 0$. (10)

Or

(b) The differential equation $\frac{dy}{dx} = x^2 + y^2$ is satisfied by $y(0) = 1, y(0.1) = 1.0110$. Determine y(0.2) and y(0.3) by Taylor series method and hence find the value of y(0.4) by using Milne's predictor – corrector method. (16)

15. (a) Solve the Poisson's equation $\nabla^2 u = 8x^2y^2$ over the square with sides $x = -2,\ x = 2,\ y = -2,\ y = 2$ with $u(x, y) = 0$ on the boundary and mesh length = 1. (16)

Or

(b) (i) Solve, by finite difference method, the boundary value problem $\frac{d^2y}{dx^2} + x\frac{dy}{dx} + y = 3x^2 + 2$, where $y(0) = 0$ and $y(1) = 1$, taking $h = 0.25$. (8)

(ii) Solve $25u_{xx} - u_{tt} = 0$ for u at the pivotal points, given $u(0,t) = u(5,t) = 0$, $u_t(x,0) = 0$ and $u(x,0) = x(5-x)$ for one half period of vibration. (taking h= 1). (8)