Reg. No. : | | | | | | | | | | | | |

Question Paper Code : 41407

B.E./B.Tech. DEGREE EXAMINATION, MAY/JUNE 2013.

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. State fixed point theorem.

2. What is the condition for convergence of Gauss-Seidel method of iteration?

3. Form the divided difference table for the data

x :	0	1	2	5
$f(x)$:	2	3	12	147

4. State Newton's backward difference interpolation formula.

5. State Simpson's 1/3 and 3/8 rule.

6. Find $Y' = (x = 1)$, given

x	1	2	3	4	5
y	1	–1	1	–1	1

7. Given $y' = x = y, y(o) = 1$ find $y(0.1)$ by Euler's method.

8. Write down Milne's predictor corrector algorithm.

9. State finite difference scheme of $u_{xx} + u_{yy} = 0$.

10. Define Standard Five Point formula.

PART B — (5 × 16 = 80 marks)

11. (a) (i) Using Newton-Raphson method, find a root of $xe^x = 1$. (8)

(ii) Solve $10x + y + z = 12$, $2x + 10y + z = 13$, $x + y = 5z = 7$ by Gauss-Jordon method. (8)

Or

(b) (i) Find a real root of the equation $x^3 - 9x + 1 = 0$ by Regula-Falsi method. (8)

(ii) Find the largest eigen value of the matrix $\begin{pmatrix} 25 & 1 & 2 \\ 1 & 3 & 0 \\ 2 & 0 & -4 \end{pmatrix}$ and the corresponding eigen vector by power method. (8)

12. (a) (i) From the following table, find the value of tan 45° 15' by Newton's forward interpolation formula. (8)

$x°$	45	46	47	48	47	50
$\tan n°$	1	1.03553	1.07237	1.11061	1.15037	1.19175

(ii) Fit the cubic spline for the data (8)

x	0	1	2	3
$f(x)$	1	2	9	28

Or

(b) (i) Find the polynomial $f(x)$ by using Lagrange's formula and hence find $f(3)$ for (8)

x	0	1	2	5
$f(x)$	2	3	12	143

(ii) Find the polynomial which passes through the points (0, 3), (2,–3), (4, –1), (6,9), (8,27) and (10, 53). (8)

13. (a) (i) Using Romberg's method, evaluate $\int_0^1 \frac{dx}{1+x}$ correct to three decimal places by taking h=.5, .25, .0125. (8)

(ii) From the following table, find the value of x for which $f(x)$ is maximum. Also find the maximum value (8)

x	60	75	90	105	120
$f(x)$	28.2	38.2	43.2	40.9	37.7

Or

(b) (i) Evaluate $\int_1^2\int_1^2 \frac{dxdy}{x+y}$ with $h = k = .2$ by using Trapezoidal rule. (8)

(ii) Find $f'(x)$, $f''(x)$ at $x = 1.5$ given (8)

x	1.5	2.0	2.5	3.0	3.5	4.0
$f(x)$	3.375	7.0	13.625	24	38.875	59.0

14. (a) (i) Using Taylor's series method compute $y(0.1)$, y(0.2) if $y' = 1 - 2xy$, $y(0) = 0$. (8)

(ii) Using R-K method of 4th order solve $\frac{dy}{dx} = \frac{y^2 - x^2}{y^2 + x^2}$ given $y(0) = 1$ at $x = .2$. Take $h = .2$. (8)

Or

(b) Given $\frac{dy}{dx} = \frac{(1+x^2)y^2}{2}$, $y(0) = 1$, $y(.1) = 1.06$, $y(.2) = 1.12$, $y(.3) = 1.21$. Compute $y(.4)$ by Milne's predictor corrector formula. (16)

15. (a) Solve the Laplace's equation over the square mesh of side 4 units satisfying the boundary condition

$$u(0,y) = 0, 0 \le y \le 4; \quad u(4,y) = 12 + y, 0 \le y \le 4$$
$$u(x,0) = 3x, 0 \le x \le 4; \quad u(x,y) = x^2, 0 \le x \le 4;$$

(16)

Or

(b) Solve $\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial t^2}$ in $0, x > 5$; $t > 0$ given that $u(x,0) = 20$, $u(0,t) = 0$, $u(5,t) = 100$. Compute u for one time step with $h = 1$ by Crank-Nicholson method. (16)

———————