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

Question Paper Code : 63256

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2016.

Fifth Semester

Electronics and Communication Engineering

MA 1251 — NUMERICAL METHODS

(Common to Information Technology)

(Regulations 2008)

Time : Three hours   Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. State the fixed point theorem.

2. Compare the efficiency of Gauss-elimination and Gauss-Jordan methods for solving large size of linear systems.

3. State any two properties of divided differences.

4. What are the advantages of Lagrange's formula over Newton?

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

6. Find $\frac{dy}{dx}$ at $x=1$ given

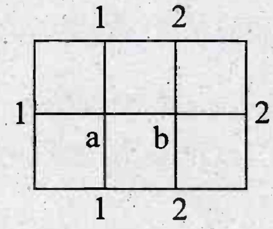
x:	1	2	3	4	5
y:	1	–1	1	–1	1

7. Given $y' = x + y, y(1.2) = 2$, find $y(1.4)$, using Euler's method if $h = 0.2$.

8. What is the error committed in Milne's predictor formula?

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

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



PART B — ($5 \times 16 = 80$ marks)

11. (a) (i) Find the real positive root of $3x - \cos x - 1 = 0$ by Newton's method correct to 3 decimal places. (8)

(ii) Solve the following set of equations using Gauss-Jordan method $10x + y + z = 12$; $2x + 10y + z = 13$; $x + y + 5z = 7$. (8)

Or

(b) (i) Find the numerically largest eigenvalue of $\begin{bmatrix} 1 & 3 & -1 \\ 3 & 2 & 4 \\ -1 & 4 & 10 \end{bmatrix}$, by using power method. (8)

(ii) Solve the following set of equations using Gauss Seidel iterative procedure
$20x + y - 2z = 17$; $3x + 20y - z = -18$; $2x - 3y + 20z = 25$. (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
$\tan x°$:	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 Largange'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 Newton's differences method, find $f'(1)$ and $f'(4)$ from the table : (8)

x :	1	2	3	4
$f(x)$:	2	4	8	16

(ii) Compute the integral $\int_0^{2.5} e^x\,dx$ by Trapezoidal rule and Simpson's $1/3^{rd}$ rule with $h = 0.5$. Also compare with exact solution. (8)

Or

(b) (i) Using Romberg's method, evaluate $\int_0^{\pi} (\sin x)dx$ correct to four decimals. (8)

(ii) Estimate $\int_0^1 \frac{\sin x}{\sqrt{x}}dx$ as accurately as possible with $h = 1/4$. (8)

14. (a) (i) Using Taylor series method, obtain the value of y to three significant figures at $x = 0.2, 0.4$ give $y' = x - y^2$ and $y(0) = 1$. (8)

(ii) Given $y' = 2e^x - y$, $y(0) = 2$, $y(0.1) = 2.010$, $y(0.2) = 2.040$, $y(0.3) = 2.090$. Use Adam's method to estimate $y(0.4)$. (8)

Or

(b) (i) Solve $y' = 1 + xy$ using Runge-Kutta method of order four for $x = 0.2$ given $y(0) = 2$ taking $h = 0.2$. (8)

(ii) Using Milne's predictor and corrector formulae, find $y(0.4)$, given $y' = y - \frac{2x}{y}$, $y(0) = 1$, $y(0.1) = 1.0959$, $y(0.2) = 1.1841$, $y(0.3) = 1.2662$. (8)

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)