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

J 3279

B.E./B.Tech. DEGREE EXAMINATION, MAY/JUNE 2009.

Sixth Semester

(Regulation 2004)

Computer Science and Engineering

MA 1251/MA 1011 — NUMERICAL METHODS

(Common to Chemical Engineering, Information Technology, Mechanical Engineering/Automobile Engineering)

(Common to M.A. 1011 Numerical Methods – (Elective) for Electronics and Communication Engineering)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — ($10 \times 2 = 20$ marks)

1. State fixed point theorem and the fixed point iteration formula.

2. What is the condition for the convergence of Gauss-Jacobi method in solving a system of simultaneous linear equations?

3. State Newton's divided difference interpolation formula for unequal intervals.

4. Supply the conditions for a spline to be cubic.

5. Write the backward difference formula to compute $f'(x)$ and $f''(x)$ at $x = x_n$.

6. Compute $\int_{-2}^{2} e^{-x^2/2} dx$ using Gaussian two point formula.

7. Supply the modified Euler's formula for the solution of ordinary differential equation.

8. Give a comparison of Adam's Bashforth method with Runge-Kutta methods.

9. Give the Crank-Nicholson difference scheme for the solution of $u_{xx} = au_t$ subjected to $u(0,t) = T_0$; $u(l,t) = T_1$ and $u(x,0) = f(x)$.

10. Give the initial and boundary conditions for the wave equation and an explicit formula for its solution.

PART B — ($5 \times 16 = 80$ marks)

11. (a) Solve the following system of equations by Gauss-Seidel's iteration method.

$$10x_1 + 2x_2 + x_3 = 9;$$
$$x_1 + 10x_2 - x_3 = -22;$$
$$-2x_1 + 3x_2 + 10x_3 = 22.$$

Or

(b) Find the inverse of the matrix $A = \begin{pmatrix} 1 & -2 & 3 \\ 0 & -1 & 4 \\ -2 & 2 & 0 \end{pmatrix}$ by Gauss Jordan method.

12. (a) Determine by Lagrange's interpolation method the percentage number of patients over 40 years using the following data :

Age over (x) years :	30	35	45	55
% number (y) of patients :	148	96	68	34

Or

(b) Find a polynomial of degree 4, which takes the following values, using Newton's forward difference formula.

x :	2	4	6	8	10
y :	0	0	1	0	0

13. (a) From the following table, which gives the velocity v of a body, during the time t, find its acceleration at $t = 1.1$.

t :	1.0	1.1	1.2	1.3	1.4
v :	43.1	47.7	52.1	56.4	60.8

Or

(b) Evaluate $\int_0^2 \int_0^1 4xy\,dx\,dy$ by using Simpson's rule, taking $h = \frac{1}{4}$ and $k = \frac{1}{2}$.

14. (a) Solve the equation $\frac{dy}{dx} = 1 - y$ given $y(0) = 0$ using modified Euler's method and compute y at $x = 0.1, 0.2$ and 0.3.

Or

(b) Using Runge Kutta method of fourth order, find $y(0.8)$ correct to 4 decimal places if $y' = y - x^2$ given $y(0.6) = 1.7379$.

15. (a) Solve the Poisson's equation $\nabla^2 u = -10(x^2 + y^2 + 10)$ over the square mesh with sides $x = y = 0$; $x = y = 3$ with $u = 0$ on the boundary and mesh length 1 unit.

Or

(b) Solve $u_{xx} = 32u_t$ with $h = 0.25$ for $t > 0$; $0 < x < 1$ and $u(x,0) = u(0, t) = 0$; $u(1,t) = t$ using Bender-Schmidt formula.
