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31st -

Question Paper Code : 21526

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

Sixth Semester

Computer Science and Engineering

MA 2264/MA 41/MA 51/080280026/10177 MA 401/ 10144 CSE 21/ 10144 EC 15 – NUMERICAL METHODS

(Common to Electronics and Communication Engineering and Information Technology Fifth Semester – Polymer Technology, Chemical Engineering and Polymer Technology to Fourth Semester – Aeronautical Engineering, Civil Engineering, Electrical and Electronics Engineering and Mechatronics Engineering)

(Also common to Fourth Semester MA 1251 – Numerical methods for Civil Engineering, Aeronautical Engineering and Electrical and Electronics Engineering)

(Regulation 2008/2010)

Time : Three hours   Maximum : 100 marks

Answer ALL questions.

PART A — ($10 \times 2 = 20$ marks)

1. Find an iterative formula to find the reciprocal of a given number $N(N \neq 0)$.

2. What is the Use of Power method?

3. State Newton's forward interpolation formula.

4. Using Lagrange's formula, find the polynomial to the given data.

X:	0	1	3
Y:	5	6	50

5. State Simpson's one-third rule.

6. Evaluate $\int_0^{\pi} \sin x\, dx$ by Trapezoidal rule by dividing ten equal parts.

7. Find $y(1.1)$ *if* $y' = x + y, y(1) = 0$ by Taylor series method.

8. State Euler's formula.

9. Obtain the finite difference scheme for the differential equation $2y''+y=5$.

10. Write Liebmann's iteration process.

PART B — (5 × 16 = 80 marks)

11. (a) (i) Find a positive root of the equation $\cos x - 3x + 1 = 0$ by using iteration method. (8)

(ii) Solve, by Gauss-Seidel method, the equations $27x + 6y - z = 85$, $6x + 15y + 2z = 72$, $x + y + 54z = 110$. (8)

Or

(b) (i) Find, by Gauss-Jordan method, the inverse of the matrix $A = \begin{bmatrix} 4 & 1 & 2 \\ 2 & 3 & -1 \\ 1 & -2 & 2 \end{bmatrix}$. (8)

(ii) Using Jacobi method find the all eigen values and their corresponding eigen vectors of the matrix $A = \begin{bmatrix} 2 & 3 \\ 3 & 2 \end{bmatrix}$. (8)

12. (a) (i) Apply Lagrange's formula, to find y(27) to the data given below. (8)

x :	14	17	31	35
y :	68.8	64	44	39.1

(ii) Fit a polynomial, by using Newton's forward interpolation formula, to the data given below. (8)

x :	0	1	2	3
y:	1	2	1	10

Or

(b) (i) Use Newton's divided difference formula to find $f(x)$ from the following data (8)

x :	1	2	7	8
y :	1	5	5	4

(ii) Using cubic spline, compute y(1.5) from the given data. (8)

x :	1	2	3
y :	–8	–1	18

13. (a) (i) Find the first three derivatives of $f(x)$ at $x = 1.5$ by using Newton's forward interpolation formula to the data given below. (8)

x :	1.5	2	2.5	3	3.5	4
y :	3.375	7	13.625	24	38.875	59

(ii) Using Trapezoidal rule, evaluate $\int_{-1}^{1} \frac{1}{(1+x^2)}\, dx$ by taking eight equal intervals. (8)

Or

(b) (i) Evaluate $\int_0^2 \frac{x^2+2x+1}{1+(x+1)^2}\, dx$ by Gaussian three point formula. (8)

(ii) Evaluate $\int_1^{1.4} \int_2^{2.4} \frac{1}{xy} dx\, dy$ using Simpson's one-third rule. (8)

14. (a) (i) Using Taylor series method to find $y(0.1)$ *if* $y' = x^2 + y^2, y(0) = 1$. (8)

(ii) Using Runge-Kutta method find $y(0.2)$ if $y'' = xy'^2 - y^2$, $y(0)=1$, $y'(0) = 0$, $h = 0.2$. (8)

Or

(b) (i) Solve $y' = \frac{y-x}{y+x}$, $y(0) = 1$ at $x = 0.1$ by taking $h = 0.02$ by using Euler's method. (8)

(ii) Using Adam's method to find $y(2)$ if $y' = (x+y)/2$, $y(0) = 2$, $y(0.5) = 2.636$, $y(1) = 3.595$, $y(1.5) = 4.968$. (8)

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

Or

(b) (i) Solve $u_{xx} = 32u_t$, $h = 0.25$ for $t \geq 0, 0 < x < 1, u(0,t) = 0, u(x,0) = 0$, $u(1,t) = t$. (8)

(ii) Solve $4u_{tt} = u_{xx}$, $u(0,t) = 0$, $u(4,t) = 0$, $u(x,0) = x(4-x)$, $u_t(x,0) = 0$, $h = 1$ upto $t = 4$. (8)