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

Question Paper Code : 42771

B.E./B.Tech. DEGREE EXAMINATION, APRIL/MAY 2018

Fourth Semester

Civil Engineering

MA 2264 – NUMERICAL METHODS

(Regulations 2008)

(Common to Sixth Semester-Electronics and Communication Engineering, computer Science and Engineering, Industrial Engineering, Information Technology and Fifth Semester-Polymer Technology, Chemical Engineering, Polymer Technology and Fourth Semester-Aeronautical Engineering, Civil Engineering, Electrical and Electronic Engineering, Mechatronics Engineering)

Time : Three Hours Maximum : 100 Marks

Answer ALL questions.

PART – A (10×2=20 Marks)

1. What is the condition for the convergence of fixed point iteration method ?

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

3. Construct a table of divided difference for the following data.

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

4. Write down the Newton's forward interpolation formula for equal intervals.

5. For what type of curve the Simpson's rule will give exact result ?

6. Write down the forward difference formulae to compute the first two derivatives at the point $X = X_0$.

7. Write down the general Euler's algorithm and its order.

8. How many values are needed to apply Adam's method prior to the required value ?

9. Classify the partial differential equation $u_{xx}+2u_{xy}+u_{yy}=0$.

10. Write down the explicit formula for the solution of the one dimensional wave equation.

PART – B (5×16=80 Marks)

11. a) i) Solve $x^3 - 2x - 5 = 0$ for a positive root by using iteration method. (8)

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

(OR)

b) i) Solve the following system of equations using Gauss-Jacobi method. $4x + y + z = 6$, $x + 4y + z = 6$, $x + y + 4z = 6$. (8)

ii) Find the largest Eigenvalue and the corresponding Eigenvector of the matrix $A = \begin{bmatrix} 25 & 1 & 2 \\ 1 & 3 & 0 \\ 2 & 0 & 4 \end{bmatrix}$ by using power method. (8)

12. a) i) Use Lagrange's formula to find the value of y corresponding to x = 1 from the given table.

x :	-1	0	2	3
y :	-8	3	1	12

(8)

ii) Find the interpolation polynomial y = f(x) for the following data using Newton's divided difference formula and also find the value of f(9).

x :	5	7	11	13	17
f(x) :	150	392	1452	2366	5202

(8)

(OR)

b) Fit the following four points by using the cubic splines.

x :	0	2	4	6
y :	1	9	41	41

Use the conditions $y_0'' = 0$ and $y_3'' = -12$. (16)

13. a) i) Find the values of $y'(8)$ and $y''(9)$ from the following data.

x :	4	5	7	10	11
y :	48	100	294	900	1210

(8)

ii) Evaluate $\int_0^1 e^{-x2} dx$ by dividing the range of integration into 4 equal intervals using Simpson's rule. **(8)**

(OR)

b) i) Evaluate $\int_0^{\pi/2} (\sin t)\, dt$ by using Gaussian two point formula. **(8)**

ii) Evaluate the integral $\int_0^1 \int_0^1 (e^{x+y})\, dx\, dy$ by using Trapezoidal rule with step sizes h = k = 0.5. **(8)**

14. a) Given that $\frac{dy}{dx} = \frac{(1+x^2)\, y^2}{2}$ with y (0) = 1, y (0.1) = 1.06, y(0.2) = 1.12 y(0.3) = 1.21 evaluate y (0.4) by using Milne's method. **(16)**

(OR)

b) Solve $\frac{dy}{dx} = xy$, given that y (0.1) = 2 compute y (1.2) and y (1.4) by using Runge-Kutta method of fourth order. **(16)**

15. a) Solve the equation $\nabla^2 u = 0$ in $0 \le x \le 1$, $0 \le y \le 1$ given that u (0, y) = 10, u (1, y) = 10, u (x, 0) = 20 and u (x, 1) = 20 by taking h = 0.25. Obtain the result correct to three decimal places. **(16)**

(OR)

b) Solve the equation $\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2}$, given that u (0, t) = U (5, t) =0, U (x, 0) = $x^2 (25 - x^2)$, find u in the range taking h = 1 up to 5 seconds by using Bender-Schmidt recurrence equation. **(16)**
