b) i) Apply Simpson's rule to evaluate the integral $\int_{2}^{2.6}\int_{4}^{4.4}\frac{dxdy}{xy}$.

(Take h = 0.2, k = 0.3). **(8)**

ii) Evaluate $\int_{0}^{1}\frac{dx}{1+x}$ correct to three decimal places using Romberg's method.

Hence find the value of $\log_e 2$. **(8)**

14. a) i) Given $y'=\frac{1}{x+y}$, y(0) = 2, y(0.2) = 2.0933, y(0.4) = 2.1755, y(0.6) = 2.2493,

find y (0.8) by Milne's predictor corrector method. **(8)**

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

(OR)

b) Find y(0.1), y(0.2) and y(0.3) using Runge-Kutta method of fourth order given that $\frac{dy}{dx}=\frac{1}{2}(1+x)y^2$, y (0) = 1 . Continue your calculation to find y(0.4) using Adams method. **(16)**

15. a) Solve $\nabla^2 u = 0$ in the square region bounded by x = 0, x = 4, y = 0, y = 4 and with the boundary conditions $u(0, y) = y^2/2$, $u(4, y) = y^2$, u(x, 0) = 0 and u(x, 4) = 8 + 2x taking h = 1, k = 1. **(16)**

(OR)

b) Using Bender – Schmidt's formula solve $f_{xx} = f_t$, f(0, t) = 0, f(5, t) = 0, $f(x, 0) = x^2 (25 - x^2)$ the range taking h = 1. Find f (x, t) upto t = 5. **(16)**

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

Question Paper Code : 52768

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2017

Fourth Semester

Civil Engineering

MA 2264 – NUMERICAL METHODS

(Common to Manufacturing Engineering/Aeronautical Engineering/ Computer Science and Engineering/Electrical and Electronics Engineering/Electronics and Communication Engineering/Industrial Engineering/ Industrial Engineering and Management/Materials Science and Engineering/ Mechanical Engineering/Mechanical and Automation Engineering/Mechatronics Engineering/Medical Electronics Engineering/Production Engineering/Information Tech./Plastic Technology/Chemical Engineering/Chemical and Electrochemical Engineering/Polymer Technology)

(Regulations 2008)

Time : Three Hours Maximum : 100 Marks

Answer ALL questions

PART – A **(10×2=20 Marks)**

1. What is the condition for applying the fixed point iteration method to find the real root of the equation x = f(x) ?

2. State the order of convergence and the criterion for the convergence in Newton's method.

3. Using Lagrange's interpolation formula, find a polynomial through (0, 0), (1, 1), (2, 2).

4. Find the divided difference of $f(x) = x^3 + x + 2$ for the arguments 1, 3, 6, 11.

5. What is the restriction on the number of intervals for using trapezoidal rule and Simpson's rule ?

6. Write the 2 points Gaussian quadrature formula.

7. In solving $\frac{dy}{dx} = f(x, y)$, $y(x_0) = y_0$, write down Taylor series for $y(x_1)$.

8. State the modified Euler algorithm to solve $y' = f(x, y)$, $y(x_0) = y_0$ at $x = x_0 + h$.

9. Write down the finite difference approximation for y' and y''.

10. State the explicit scheme formula for the solution of the wave equation.

PART – B **(5×16=80 Marks)**

11. a) i) Using Gauss-Jordan method, find the inverse of matrix $\begin{pmatrix} 2 & 2 & 6 \\ 2 & 6 & -6 \\ 4 & -8 & 8 \end{pmatrix}$ **(8)**

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

(OR)

b) i) Use Gauss-Seidel iterative method to obtain the solution of the equations : $4x + 2y + z = 14$; $x + 5y - z = 10$; $x + y + 8z = 20$. **(8)**

ii) Use Newton's Raphson method to find the root of $x \log_{10} x = 12.34$ start with $x_0 = 10$. **(8)**

12. a) Find the cubic spline approximation for the function $y = f(x)$ from the following data, given that $y''_0 = y''_3 = 0$. **(16)**

x	–1	0	1	2
y	–1	1	3	35

(OR)

b) i) From the following table of half-yearly premium for polices maturing at different ages; estimate the premium for polices maturing at age 46 and 63.

Age (x)	45	50	55	60	65
Premium (y)	114.84	96.16	83.32	74.48	68.48

(10)

ii) Using Lagrange's interpolation, calculate the profit in the year 2000 from the following data.

Year	1997	1999	2001	2002
Profit in Lakhs of Rs.	43	65	159	248

(6)

13. a) i) Calculate $\int_2^{10} \frac{dx}{1+x}$ by dividing the interval into eight equal parts and hence find an approximate value of $\log_e \frac{11}{3}$. **(8)**

ii) Compute $f'(0)$ and $f''(4)$ from the following data. **(8)**

x	0	1	2	3	4
f(x)	1	2.718	7.381	20.086	54.598

(OR)