

Question Paper Code:94023

B.E. / B.Tech. DEGREE EXAMINATION, MAY 2021

Fourth Semester

Civil Engineering

19UMA423 - NUMERICAL METHODS

Common to Chemical Engineering

(Regulation 2019)

Duration: 1:45hrs

Maximum: 50 Marks

PART A 10*2 =20 Marks

Answer any ten of the following questions

1. State Newton's Iterative formula CO1- U
 - Write the condition of convergence of Newton's method CO1- R
 - 2.
 3. Using Power method find the dominant Eigen value of $\begin{pmatrix} 1 & 0 \\ -4 & 3 \end{pmatrix}$ CO6- U
 4. Define Cubic spline CO2- R
 5. Form the divided difference table for the following data CO2- U
- | | | | |
|---|---|----|-----|
| x | 2 | 5 | 10 |
| y | 5 | 29 | 109 |
6. In Newton's forward formula, $u =$ CO2- R
 7. Truncation error in Trapezoidal rule ? CO3- R
 8. State Simpson's $\frac{1}{3}$ rule to evaluate $\int_a^b f(x)dx$ CO3- U
 - 9 Write down Romberg's formula for I_1 and I_2 as well as I_2 and I_3 CO3- R
 - 10 Using Euler's method find $y(0.1)$ given $\frac{dy}{dx} = 1 + y^2$, $y(0) = 0$ CO6- AP
 - 11 Using Taylor's series method find $y(1.1)$ given $y' = x + y$ with $y(1) = 0$ CO6- AP
 - 12 Which method is better ? Taylor's series or RK method. Why? CO6- U
 - 13 Bender-Schmidt recurrence equation is valid if $\lambda =$ CO5- U
 - 14 Classify $u_{xx} - 2u_{xy} + u_{yy} = 0$ CO5- AP
 - 15 PDE of second order, if $B^2 - 4AC > 0$ then CO5- U

PART B

3*10 =30 Marks

Answer any three of the following questions

- 16 Using Power method find numerically largest Eigen value of $\begin{pmatrix} 25 & 1 & 2 \\ 1 & 3 & 0 \\ 2 & 0 & -4 \end{pmatrix}$ CO1 - Apply (10)

- 17 Using Lagrange's interpolation formula find f(3) for the following data

X	0	1	2	5
Y	2	3	12	147

CO2-Apply (10)

- 18 Calculate the value of $\int_2^{2.41} \int_1^{1.4} \frac{1}{xy} dx dy$ by Simpson's Rule with CO3-Apply (10)

$h = 0.1$ & $k = 0.1$

- 19 Using Taylor series method find y(0.1) for $\frac{dy}{dx} = x^2 y - 1$, $y(0) = 1$ CO4-Apply (10)

- 20 Solve $\frac{\partial^2 u}{\partial x^2} = \frac{\partial u}{\partial t}$ in $0 \leq x \leq 5$, $t \geq 0$ $u(0,t) = 0$, $u(5,t) = 100$, $u(x,0) = 20$ find the values of u for 1 time step function with $h = 1$ by Crank-Nicholson's difference method. CO5-Apply (10)