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

Fourth Semester

Civil Engineering

15UMA422 - NUMERICAL METHODS

(Common to EEE, EIE and Chemical Engineering)

(Regulation 2015)

Duration: 1:45 hrs   Maximum: 50 Marks

PART A - (10 x 2 = 20 Marks)

Answer any ten of the following questions

1. Find the interval for a positive root of the polynomial $x^3 - 2x + 5 = 0$.   CO1- App

2. Find y (1) using Lagrange's interpolation formula from the given   data: CO2- App
    $x:$ 0   1   3
    $y:$ 5   6   50

3. Find $\int_0^1 \frac{dx}{1+x}$ using two-point Gaussian quadrature formula.   CO3- App

4. Find $y(1.1)$ if $y' = x + y$, $y(1) = 0$ using Taylor's series method of   CO4- App
    second order.

5. State Crank – Nicholson difference scheme to solve a parabolic equation.   CO5- R

6. What is the condition for convergence of Newton-Raphson method and order   CO1-R
    of convergence?

7. State Lagrange's interpolation formula.   CO2-R

8. Apply two point formula to evaluate   CO3-App

    $$\int_{-1}^{1} \frac{dx}{1+x^2}$$

9. Write the Euler's algorithm for first order differential equation.   CO4-R

10. Write Crank-Nicolson formula for one dimensional heat equation.   CO5-R

11. Find an iterative formula to find , where N is a positive number.   CO1-E

12. The two dimensional random variable (X,Y) has the joint density function   CO2-E
    $f(x,y) = x + 2y$, $x = 0,1,2$; $y = 0,1,2$

(1) Find the value of k

13. Why Simpson's one third rule is called a closed formula?   CO3-R

14. Solve: $dx = 1 - y, y\,0 = 0$ for $x = 0.1$ by Euler's method.   CO4-E

15 What is the classification of $f_{xx} + 2f_{xy} + f_{yy} = 0$?   CO5-R

PART – B (3 x 10= 30Marks)

Answer any three of the following questions

16. Solve the following system of equations by Gauss elimination method,   CO1 -App   (10)
    2x +3y - z = 5,   4x + 4y -3z = 3,
    2x − 3y + 2z = 2

17. Find y at x = 43, by using Newton's forward interpolation formula from   CO2 -App   (10)
    the following data,

x	40	50	60	70	80	90
y	184	204	226	250	276	304

18. Find y' and y'' at x = 1.5 from the following table,   CO3- Ana   (10)

x	1.5	2.0	2.5	3.0	3.5	4.0
y	3.375	7.0	13.625	24.0	38.875	59

19. Solve   CO4- App   (10)

    $\frac{dy}{dx} = \frac{y^2 - x^2}{y^2 + x^2}$ given y(0) = 1 at x = 0.2 and x = 0.3 using

    Runge – Kutta method of 4th order.

20. Using Explicit scheme solve the wave equation   CO5 -U   (10)

    $u_{tt} = u_{xx}$, $0 < x < 1$, $t > 0$, given   u(x, 0) = u$_t$(x,0) = u(0,t) =0 and u(1,t)
    = 100 sin(π t). Compute u for 4 times steps with h = 0.25.

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