Reg. No .... Name **21P4047**

M. Sc. DEGREE END SEMESTER EXAMINATION - APRIL 2021

SEMESTER 4 : MATHEMATICS

COURSE : **16P4MATT20EL : NUMERICAL ANALYSIS**

(For Regular - 2019 Admission and Supplementary - 2018/2017/2016 Admissions)

Time : Three Hours Max. Marks: 75

PART A

Answer All (1.5 marks each)

1. Three approximate values of the number 1/3 are 0.30, 0.33, 0.34. Which of these is the best approximation?
2. Sum the terms : 0.1532, 15.45, 0.000354, 305.1, 8.12, 143.3, 0.0212, 0.634 and 0.1734
3. State Mean Value theorem and Rolle's theorem.
4. Define centro-symmetric equations.
5. Define well conditioned matrix.
6. Express the error obtained in polynomial interpolation with n+1 values.
7. Briefly explain forward differences.
8. Prove that $E = e^{hd}$
9. If $y_1 = 4, y_3 = 12, y_4 = 19, y_x = 7$ find x.
10. Given $y' - 1 = xy$ and y(0)=1.Obtain Taylor's series for y(x) and compute y(0.1)

(1.5 x 10 = 15)

PART B

Answer any 4 (5 marks each)

11. Evaluate f(1) using Taylor's series for $f(x) = x^3 - 3x^2 + 5x - 10.$
12. Given f(x) = sin x, construct the Taylor's series approximation of order 0 to 7 at $x = \pi/3$ and state their absolute error.
13. Solve the system using Gauss elimination method
    0.0002x + 0.3003y = 0.1002
    2.0000x + 3.0000y = 2.0000
14. Find the cubic polynomial which takes the following values : y(1) = 24, y(3) = 120, y(5) = 336 and y(7) = 720. Hence obtain the value of y(8).
15. Derive Newton's backward interpolation formula.
16. Given the differential equation $y'' - xy' - y$= 0 with the conditions y(0)=1 and y'(0)=0, use Taylor's series method to determine the value of y(0.1).

(5 x 4 = 20)

PART C

Answer any 4 (10 marks each)

17.1. Explain the procedure to solve bisection method and hence solve $f(x) = x^3 - 2x - 5$ correct to 3 decimal places.

OR

2. Explain Gauss elimination method and solve the equations 3x+y+2z = 3, 2x-3y-z = -3, x+2y+z = 4.

18.1. Explain LU decomposition and solve the equations 2x+3y+z=9, x+2y+3z=6, 3x+y+2z=8 using LU decmposition method.

OR

2. Prove that the divided differences are symmetric in their arguments and that $[x_0, x_1]$ is the first derivative of the polynomial. Explain Aitken's Scheme along with the table.

19.1. A solid of revolution is formed by rotating about the x axis, the area between the x axis, the lines x = 0 and x = 1 and a curve through the points with the following coordinates

x	0	0.25	0.50	0.75	1.00
y	1.0000	0.9896	0.9589	0.9089	0.8415

Estimate the volume of the solid formed.

OR

2. Use predictor - corrector formulae for tabulating the solution of $y' = x + y$, y(0)=0,for the interval $0.4 < x \leq 1.0$ with h = 0.1.

20.1. Solve the given differential equation $y' = 1 + y^2$ where y=0 when x=0 using Adam - Moulton method and compute y(0.8), using fourth order Runge-kutta method to find the starter values.

OR

2. (a)Explain Picard's method of successive approximation. (b)Find the value of y(0.2),y(0.4),y(0.6), for the given differential equation $y' = 1 + y^2$ where y=0 when x=0.

(10 x 4 = 40)