Reg. No .... Name **18P447**

M Sc DEGREE END SEMESTER EXAMINATION - MARCH 2018

SEMESTER 4 : MATHEMATICS

COURSE : **16P4MATT20EL ; NUMERICAL ANALYSIS**

(For Regular - 2016 admission)

Time : Three Hours Max. Marks: 75

Section A
Answer all the following (1.5 marks each)

1. Sum the terms : 0.1532, 15.45, 0.000354, 305.1, 8.12, 143.3, 0.0212, 0.634 and 0.1734
2. Define percentage error and find the percentage error of $X = 0.5$
3. State Taylor's series for a function of several variables $x_1, x_2, x_3, \ldots x_n$
4. Define tridiagonal matrices.
5. Obtain the total number of arithmetic operations in Gauss elimination method.
6. Express the error obtained in polynomial interpolation with n+1 values.
7. Briefly explain forward differences.
8. Express lagrange polynomial of degree one passing through two points.
9. Show that $e^x(u_0 + x\Delta u_0 + (x^2/2!)\Delta^2 u_0 + \ldots) = u_0 + u_1 x + u_2(x^2/2!) + \ldots$
10. From the Taylor series for y(x), find y(0.1) if the function satisfies $y' = x - y^2$ and y(0)=1.

(1.5 x 10 = 15)

Section B
Answer any 4 (5 marks each)

11. Let $x = \epsilon$ be a root of f(x)=0 and let I be the interval containing the point $x = \epsilon$. Let $\phi(x)$ and $\phi'(x)$ be continuous in I where $x = \phi(x)$ is equivalent to $f(x) = 0$. Then if $|\phi'(x)| < 1$ for all x in I , the sequence of approximatons $x_0, x_1, , \ldots x_n$ defined by $x_{n+1} = \phi(x_n)$ converges to the root ϵ, provided the initial approximation is chosen in I.
12. Briefly explain Newton Raphson method and using it find the root of the equation $xsinx + cosx = 0$.
13. Discuss the solution of Centro-symmetric equations.
14. Using Newton's formula difference formula. Find the sum $S_n = 1^3 + 2^3 + \ldots + n^3$
15. Derive Newton's backward interpolation formula.
16. Use Euler's method to solve $y' = 1 + y^2$ with the condition y(0)=0.Find y(0.1), y(0.2) and y(0.3) by taking h =0.1.

(5 x 4 = 20)

Section C
Answer any 4 (10 marks each)

17.1. Describe the algorithm to solve Regula - Falsi method and hence solve the equation $xe^x = 1$ whose roots lie between 0 and 1.

OR

2. Desribe Gauss Jordan method and solve the equations 5x-2y+z=4, 7x+y-5z=8, 3x+7y+4z=10.

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

OR

2. Derive Newtons forward difference formula for first and second order derivative and use it to obtain the first and second derivative at x = 1.2 for the function which fits the data : (1, 2.7183), (1.2, 3.3201), (1.4, 4.0552),(1.6, 4.9530),(1.8, 6.0496), (2, 7.3891), (2.2, 9.0250).

19.1. a) Derive the lagrange interpolation fromula and write its inverse. b) Find the Lagrange interpolating polynomial of degree 2 defined by the following data: f(2) = 0.69315, f(2.5) = 0.91629, f(3) = 1.09861, hence determine the value of x = 2.7 along with the error $R_n(x)$.

OR

2. Solve $y' = 2 + \sqrt{(}xy)$, y(1)=1, to find the value of y(2) in steps of 0.1 using Euler's modified method.

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

OR

2. 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.

(10 x 4 = 40)