Reg. No .... Name **19P4047**

MSc DEGREE END SEMESTER EXAMINATION - MARCH/APRIL 2019

SEMESTER 4 : MATHEMATICS

COURSE : **16P4MATT20EL : NUMERICAL ANALYSIS**

(For Regular - 2017 Admission and Supplementary - 2016 Admission)

Time : Three Hours Max. Marks: 75

Section A

Answer all the following (1.5 marks each)

1. Evaluate the sum $S = \sqrt{3} + \sqrt{5} + \sqrt{7}$ to 4 significant digits and find its absolute and relative error.
2. State Taylor's series and Maclaurin's series for a function.
3. Find the relative error of the number 9.6 if both of its digits are correct.
4. Define ill-conditioned matrix.
5. Establish whether the following matrix is singular, ill conditioned or well conditioned $\begin{bmatrix} 1 & 4 & 7 \\ 2 & 5 & 8 \\ 3 & 6 & 9.1 \end{bmatrix}$.
6. Show that $e^x(u_0 + x\Delta u_0 + (x^2/2!)\Delta^2 u_0 + \ldots) = u_0 + u_1 x + u_2(x^2/2!) + \ldots$
7. Define $[x_o, x_1, x_2]$
8. Evaluate $\Delta(x+1)(x+2)$
9. Evaluate $\Delta(\tan^{-1} x)$.
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. Briefly explain Newton - Raphson method and using it find the root of the equation $x = e^{-x}$
12. Use the method of iteration to find a real root of the equation $x^3 + x^2 - 1 = 0$ on the interval [0,1] with an accuracy of 10^{-4}.
13. Discuss the method of Tridiagonal system.
14. Using Newton's difference formula. Find the sum $S_n = 1^3 + 2^3 + \ldots + n^3$

15. Applying Lagrange's formula, find a cubic polynomial which approximates the following data:

x	-2	-1	2	3
F(x)	-12	-8	3	5

16. Determine the value of y when x = 0.1 given that y(0)=1 and $y' = x^2 + y$ using modified Euler's method with h = 0.05.

(5 x 4 = 20)

Section C

Answer any 4 (10 marks each)

17.1. a) 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 $x_0, x_1, , \ldots x_n\ x_0$ defined by $x_{n+1} = \phi(x_n)$ converges to the root ϵ, provided the initial approximation is chosen in I. b) Find a root of the equation sinx = 1 - x using Ramanujan's method.

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 the method to solve Linear systems using iterative methods.

OR

2. Explain the errors in Numerical differentiation and hence find the error obtained in first and second derivative at x = 1.6, 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. Derive Newton's general interpolation formula with divided differences.

OR

2. Solve the initial value problem $y' = 3x + y/2$ with the condition y(0)=1.Find y(0.2) and h=0.05.

20.1. Use Runge - Kutta method to solve $10y' = x^2 + y^2$,y(0)=1 , for the interval $0 < x \leq 0.4$ with h = 0.1.

OR

2. Derive the predictor - corrector formula using Newton's backward and forward difference interpolation formula.

(10 x 4 = 40)