LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

M.Sc. DEGREE EXAMINATION – **MATHEMATICS**

FOURTH SEMESTER – **APRIL 2022**

PMT 4502 – NUMERICAL METHODS USING C++

Date: 17-06-2022 Dept. No. Max. : 100 Marks
Time: 01:00 PM - 04:00 PM

Answer ALL Questions **5 x 20=100**

1. (a) Using Bisection method find the root of the equation $3x + sinx - e^x$ =0.

OR

(b) Solve $e^x - 3x = 0$ by the method of iteration. (5)

(c) Find the root of the equation $x^4 - x - 10 = 0$, correct up to five decimal places by Newton's Raphson method.

OR

(d) Find the real root of the equation $x^3 - 9x + 1 = 0$, correct to five decimal places by Regula falsi method. (15)

2. (a) Solve the system of equation by Gauss elimination method $2x + 4y + 2z = 15$, $2x + y + 2z = -5, 4x + y - 2z = 0.$

OR

(b) Solve the following equations by Jacobi method $83x + 11y - 4z = 95$, $7x + 52y + 13z = 104, 3x + 8y + 29z = 71.$ (5)

(c) Solve the equation by triangularization method $2x + 3y + z = 9$, $x + 2y + 3z = 6$, $3x + y + 2z = 8.$

OR

(d) Apply Gauss Seidel method to solve the following equation
$5x + 2y + z = 12$
$x + 4y + 2z = 15$
$x + 2y + 5z = 20$ (15)

3. (a) Derive Gregory-Newtons backward interpolation formula.

OR

(b) The following data gives *I*, the indicated HP and *V*, the speed in knots developed by a ship

V	8	10	12	14	16
I	1000	1900	3250	5400	8950

Find *I,* when *V*=9, using Newton's forward interpolation formula. (5)

(c) Use Lagrange's interpolation formula to find the value of y when x=0, x=2, x=5, x=6.

x	-2	1	3	7
y	5	7	11	34

OR

(d) Using Stirling's formula find $e^{0.644}$ correct to four decimal places from the following table

x	0.61	0.62	0.63	0.64	0.65	0.66	0.67
e^x	1.840431	1.858928	1.877610	1.896481	1.915541	1.934792	1.954237

(15)

4. (a) Derive the derivatives using Stirling's formula.

OR

(b) Find the maximum value of y from the following table

x	-1	1	2	3
y	-21	15	12	3

(5)

(c) Using Bessel's formula, find the derivative of $f(x)$ at $x = 3.5$ from the following table

x	3.47	3.48	3.49	3..50	3.51	3.52	3.53
F(x)	0.193	0.195	0.198	0.201	0.203	0.206	0.208

OR

(d) . Evaluate $\int_0^{10} \frac{dx}{1+x^2}$ using (i) Trapezoidal rule (ii) Simpson's $\frac{1}{3}$ rule and (iii) Simpson's $\frac{3}{8}$ rule.

(15)

5. (a) Solve the system of differential equations $\frac{dy}{dx} = xz + 1$, $\frac{dy}{dx} = -xy$ for x=0.3 using fourth order Runge-kutta method with the values x= 0, y= 0, z= 1.

OR

(b) Use Picard's method to approximate the value of y when $x = 0.1$ given that $y = 1$, when x =0 and $\frac{dy}{dx} = 3x + y^2$. (5)

(c) Derive the formula of Taylor's series and using that method find y at x=1.1 and 1.2 by solving $\frac{dy}{dx} = x^2 + y^2$, given $y(1) = 2.3$.

OR

(d) Consider the second order initial value problem $y'' - 2y' + 2y = e^{2t} sint$ with $y(0) = -0.4$ and $y'(0) = -0.6$. Using fourth order Runge-Kutte method, find $y(0.2)$.

(15)

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