MMDSC-1.5

Sl.No. :

Total No. of Pages : 3

I Semester M.Sc. Degree Examination May/June - 2023

(CBCS, SLM Scheme)

MATHEMATICS

Numerical Analysis

Time : 3 Hours **Max. Marks : 80**

Instructions: ***1) Answer any five full questions.***
2) All questions carry equal marks.

Q1) a) Derive the formula of secant method to find roots of the equation $f(x) = 0$.

b) Perform four iterations of Newton- Raphson method to find a real root of the equation. $f(x) = \text{Cos } x - xe^x = 0$.

c) Derive K^{th} iterative formula of Mulles method based on the second degree equation.

[4+4+8]

Q2) a) Explain rate of convergence of Mulles method and Chebyshev method.

b) Prove that the rate of convergence of Newton-Raphson method is 2.

[10+6]

Q3) a) Describe the Birge-Vieta method to find the roots of the Polynomial equation $P_n(x) = 0$.

b) Perform two iterations of Bairstow method to extract a quadratic factor $x^2 + Px + q$ from the polynomial $x^3 + x^2 - x + 2 = 0$

[8+8]

Q4) a) Describe Lagrange's interpolation method. Obtain the truncation errop formula.

b) Define and explain Piecenrise and Spline interpolations.

[8+8]

Q5) a) Given the following values of $f(x)$ and $f'(x)$

x	$f(x)$	$f'(x)$
–1	1	–5
0	1	1
1	3	7

Estimate the values of $f(-0.5)$ and $f(0.5)$ using the Hermite interpolation. The exact values are $f(-0.5) = \frac{33}{64}$ and $f(0.5) = \frac{97}{64}$.

b) Derive the uniform Polynomial approximation.

[8+8]

Q6) a) Define a numerical differentiation method of order 'P'. Obtain numerical differentiation methods based on finite difference operators.

b) Derive the trapezoidal method using the method of undetermined coefficients. Obtain the truncation error.

[8+8]

Q7) a) Evaluate the integral $I = \int_{y=1}^{1.5} \int_{x=1}^{2} \frac{dx.dy}{1+x}$ using Simpson's rule with n = 0.5 (along x- axis) and K = 0.25 (along y-axis)

b) Sketch and analyze the region of stability of Runge-Kutta Fourth order method.

[8+8]

Q8) a) Describe solving of linear second order differential equations using boundary conditions.

b) Explain shooting method to solve the boundary value problem.

[8+8]