MMDSC-1.5

Sl.No. : **Total No. of Pages : 3**

I Semester M.Sc. Degree Examination, June/July - 2024

(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 nth iterative formula of Muller method to find roots of the equation $f(x) = 0$.

b) Describe the Regula-Falsi method geometrically and obtain its nth iterative formula.

[10+6]

Q2) a) Explain rate of convergence of Muller method and chebyshev method.

b) Explain the system of non-linear equations using Newton-Raphson method.

[8+8]

Q3) a) Perform two iterations of the linear iteration method followed by one iteration of the Aitken Δ^2 method to find the root of the equation $f(x) = x - e^{-x} = 0$, $x_0 = 1$.

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 error formula.

b) Obtain piecewise quadratic interpolating polynomials for the function $f(x)$ defined by the following data.

x	–3	–2	–1	1	3	6	7
$f(x)$	369	222	171	165	207	990	1779

[8+8]

Q5) a) State and prove Hermite interpolation formula.

b) Obtain the cubic spline approximation for the function defined by the data

x	0	1	2	3
$f(x)$	1	2	33	244

With M(0) = 0, M(3) = 0. Hence find an estimate of $f(2, 5)$

[8+8]

Q6) a) Obtain the least squares polynomial approximation of degree one and two for $f(x) = x^{1/2}$ on $[0,1]$.

b) Obtain the rational approximation of the form $\frac{a_0 + a_1 x}{1 + b_1 x}$ to e^x.

c) Describe optimum choice of step-length of an iterative method.

[5+3+8]

Q7) a) Derive the trapezoidal method using the method of undetermined co-efficients. Obtain the truncation error.

b) Using Adam-Bashforth third order method solve the initial value problem $u^1 = -2tu^2$, $u(0) = 1$, on [0,1]with $n = 0.2$.

[8+8]

Q8) a) Illustrate $P(EC)^ME$ method for the equation $u' = \lambda u$ and the P–C set.

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

[8+8]

