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First Year M.Sc. Degree Examination, May - 2026
(SLM Scheme) (NON CBCS) (Second Semester)
MATHEMATICS
Math 2.4 : 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 Newton-Raphson Method that solves the non-linear equation $f(x) = 0$. Discuss the rate and condition of convergence of the same method.

b) Show that the Chebyshev method has a third order convergence.

[8+8]

Q2) a) Define the rate of convergence of an iterative method. Show that rate of convergence of Secant method is 1.618

b) Find the quadratic factors of, $x^4 - 1.1x^3 + 2.3x^2 + 0.5x + 3.3 = 0$ using Bairstows method and take $x^2 + x + 1$ as starting factor.

[8+8]

Q3) a) Find the rates of convergence of Newton Raphson method and Secant method for multiple roots with multiplicity m.

b) Using the Newton-Raphson method, solve the non-linear equations $x^2 - y^2 = 4$; $x^2 + y^2 = 16$. Take $x_0 = y_0 = 2\sqrt{2}$

[8+8]

Q4) a) Perform three iterations of Birge-Vieta method to find the smallest positive root of the polynomial $2x^3 - 5x + 1 = 0$. Also obtain the deflated polynomial.

b) Describe Lagrange's interpolation method. Obtain the truncation error formula.

[8+8]

Q5) a) 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

b) Derive the Hermite interpolating polynomial.

[8+8]

Q6) a) Derive the Uniform polynomial approximation.

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

[8+8]

Q7) a) Describe the optimum choice of step-length of an iterative method.

b) Explain the stability of Euler method.

[8+8]

Q8) a) Explain the stability of $P(EC)^mE$ method.

b) Describe the finite difference method to solve the linear second order differential equations.

[8+8]