

INDIRA UNIVERSITY, PUNE

SCHOOL OF INFORMATION TECHNOLOGY-BSC (CS)

Term End Examination (2025 Pattern) December – 2025 - Semester – I

Subject Name: Numerical Methods
Subject Code: 25BSC103T

Max. Marks: 25
Time: 1:30 Hrs.

Instructions

- All Questions are Compulsory.

CO #	Cognitive Ability	Course Outcome
CO2	Understand	Explain the logic and reasoning behind numerical methods used in solving equations, interpolation, integration, and differential equations
CO3	Apply	Analyze the behavior, limitations, and suitability of various numerical methods in different scenarios.
CO6	Create	Design and construct computational approaches using numerical techniques to solve applied science or engineering problems.

Q1.	<p>Attempt any 5 out of 7. (1 mark each) (5 Marks)</p> <p>a) Illustrate the relative error of the number 8.6 if both of its digits are correct</p> <p>b) Round-off the number 75462 to four significant digits and then calculate its absolute error, relative error and percentage error.</p> <p>c) Use Lagrange's interpolation formula to illustrate the polynomial $P(x)$ which satisfies $P(0) = 2$, $P(2) = 8$, $P(3) = 27$</p> <p>d) Illustrate the Newton's forward difference table $y(5) = 10$, $y(15) = 35$, $y(25) = 75$, $y(35) = 150$, $y(45) = 300$</p> <p>e) True/False: The Trapezoidal Rule is an approximation technique that requires at least two subintervals for accuracy.</p> <p>f) Illustrate the conditions must be satisfied for Simpson's 1/3rd rule</p> <p>g) Write the Euler's formula.</p>	CO2
Q2.	<p>Attempt any 2 out of 4. (5 marks each) (10 Marks)</p> <p>a) Construct the real root of the equation $x^3 - 4x + 1 = 0$ between (1,2) using Regula Falsi method</p> <p>b) Estimate $\Delta^2 e^{3x}$</p>	CO6

	<p>c) Solve $\int_0^1 x^3 dx$ by trapezoidal rule. Take $h = 0.5$</p> <p>d) Given that $\frac{dy}{dx} = x + y + 1$, with $y(0)=1$, Construct $y(0.1)$ by Euler's Method, $h=0.1$.</p>	
Q.3.	Attempt all questions. (5 marks each)	(10 Marks)
Q.3.A	<p>i. Use the Runge-Kutta fourth order method to construct y at $x = 0.2$. Given that $\frac{dy}{dx} = y - x$, $y(0) = 2$, Take $h = 0.1$</p> <p>ii. Solve $\int_0^1 \frac{1}{1+x} dx$ by dividing $[0, 1]$ into 6 equal parts by using Simpson's 3/8th rule.</p>	CO3
Q.3.B	<p style="text-align: center;">OR</p> <p>Derive the formula for Newton's Gregory Backward Interpolation formula.</p>	
		(10 Marks)
