Reg No.: _____ Name : _____

Jyothi Engineering College(Autonomous)

M.Tech Degree S1 (R) Examination, December 2025 (2025 Scheme)

25PIAT101- COMPUTATIONAL METHODS FOR ENGINEERS

Total Mark: 60 Total Time: 2hr 30min

CO MARK

PART A

Answer All Questions

1. Find an approximation to the real root of $f(x) = x^3 - 2x - 5$ in the interval $[2, 3]$ using 5 bisection iterations. Show the interval after each iteration and the midpoint approximation. CO1 (5)

2. Explain simple linear regression. Derive the expressions for the regression coefficients using the method of least squares. CO2 (5)

3. Evaluate by Trapezoidal rule $\int_0^5 \frac{1}{4x+5}dx$ dividing the range into 10 equal parts. CO3 (5)

4. Explain Taylor's series method for solving first-order ODEs. Mention its merits and demerits. CO4 (5)

5. A curve passes through the points (0,18), (1,10), (3,-18) and (6,90). Find the slope of the curve at x = 2 using Lagrange's formula. CO5 (5)

PART B

Answer Any Five Question(s)

6. Apply Gauss Jordan method to find the solution of the following systems.
   x+y+z = 9
   2x-3y+4z =13
   3x+4y+5z = 40
   CO1 (7)

7. Fit a second degree polynomial of the form $y = a + bx + cx^2$ to the following data.

x	0	1	2	3	4	5
y	2.1	7.7	13.6	27.2	40.9	61.1

CO2 (7)

8. Compute the value of $\int_{0.2}^{1.4} (\sin x - \log x + e^x)dx$ using Simpsons's one third rule into 6 equal subintervals. CO3 (7)

9. Find $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$ at x = 1.1 using forward interpolation from the following data.

x	1.0	1.1	1.2	1.3	1.4	1.5	1.6
y	7.989	8.403	8.781	9.129	9.451	9.750	10.031

CO3 (7)

10. Given $\frac{dy}{dx} = x^3 + y, y(0) = 2$. Also y(0.2) = 2.073, y(0.4) = 2.452 and y(0.6) = 3.023. Find y(0.8) by Milne's predictor -corrector method taking h = 0.2. CO4 (7)

11. Apply the Runge-Kutta method to find the approximate value of y for x = 0.2 in steps of 0.1, if $\frac{dy}{dx} = x + y^2, y = 1$ where x = 0. CO4 (7)

12. Solve $\nabla^2 u = 8x^2y^2$ for a square mesh given u = 0 in the 4 boundaries dividing the square into 16 sub-squares of length 1 unit. CO5 (7)

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