Seat No	

S.Y.B.Tech. (Semester - IV) (CBCS)
Examination, May– 2025
(Mechanical)
Applied Numerical Methods
Sub. Code : 79119 / 63360 / 79407

Day and Date : Tuesday, 13/05/2025 **Total Marks :70**

Time : 10.30 a.m. to 1.00 p.m.

Instructions :
1) **All questions are compulsory.**
2) **Use of Non-programmable calculators series fx-82 ES, fx-82 ES Plus, fx-82 MS are only allowed.**
3) **Figures to the right indicate full marks.**
4) **Assume suitable data if necessary and mention it clearly.**

Q.1) a. Find root of equation $x^3 - 4x - 9 = 0$ lying between 2 and 3, using False position method. Perform TWO iterations. **(5)**

b. Using Muller method, find the root of equation $x^3 - 2x - 5 = 0$, which lies between 2 and 3. Perform only TWO iterations. **(6)**

OR

b. Find the positive root of $3x - \cos\ x - 1 = 0$ by Newton-Raphson method, correct up to three decimal places.

Q.2) a. Solve by Gauss elimination method. **(6)**

$3x + 4y + 5z = 18$

$2x - y + 8z = 13$

$5x - 2y + 7z = 20$

b. Solve using Gauss-Jacobi method. **(6)**

$27x + 6y - z = 85$

$x + y + 54z = 110$

$6x + 15y + 2z = 72$

OR

b. Use LU decomposition method to solve the following equations.
$10x + y + 2z = 13$
$3x + 10y + z = 14$
$2x + 3y + 10z = 15$

Q.3) a. Derive the equation of the interpolating polynomial by Newton divided Differentiable table for the following data: **(7)**

x	0	1	2	3	4	5
y	3	2	7	24	59	118

b. Fit a straight line by the method of least squares for the following data: **(5)**

x	1	2	3	4	5
y	14	27	40	55	68

OR

b. Find the value of y at $x = 10$ from the following data by using, Lagrange's interpolation formula.

x	5	6	9	11
y	12	13	14	16

Q.4) a. Find the value of $\cos(1.74)$ from the following table. **(6)**

x	1.7	1.74	1.78	1.82	1.86
$y = \sin x$	0.9916	0.9857	0.9781	0.9691	0.9584

b. Evaluate the integral $I = \int_0^6 \frac{1}{1+x} dx$ using Simpson's $3/8^{th}$ rule by taking n =6. **(6)**

OR

b. Evaluate $\int_{-1}^{1} \frac{dx}{1+x^2}$ using Gauss formula for n = 2 and n = 3.

Q.5) a. Solve $\frac{dy}{dx} = 1 - y, y(0) = 0$ using Euler's method. Find y at x = 0.1 and x = 0.2 Compare the results with results of exact solution. **(6)**

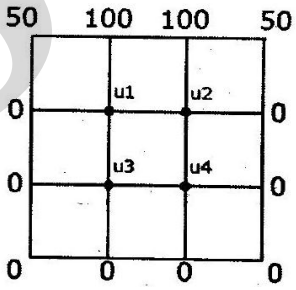
b. Given the boundary value problem, $\frac{d^2y}{dx^2} = 6x + 4, y(0) = 2, y(1) = 5,$ obtain its solution in the range $0 \leq x \leq 1$ with $h = 0.25$ using Finite difference method. **(5)**

OR

b. Use Power method to find the largest Eigen value and the corresponding Eigen vector for the following matrix.

$$\begin{bmatrix} 4 & 2 \\ 1 & 3 \end{bmatrix}$$

Q.6) a. Find the values of $u(x, y)$ satisfying the Laplace equation, $\nabla^2 u = 0$ at the pivotal points of a square region with boundary values as shown in figure. Perform only TWO iterations. **(8)**



b. Classify the following partial differential equations: **(4)**

a. $u_{xx} + 4u_{xy} + (x^2 + 4y^2)u_{yy} = \sin(x + y)$

b. $(x + 1)u_{xx} - 2(x + 2)u_{xy} + (x + 3)u_{yy} = 0$

OR

b. Derive Crank-Nicolson formula for Parabolic equations.
