K. K. Wagh Institute of Engineering Education & Research, Nashik
(An Autonomous Institute From A.Y. 2022-23)

WINTER-2025	
Exam Seat No.:	
Academic Year:2025-2026	Semester:I
Class:PG-I	Program:M.Tech
Branch Code:CIV	Pattern:2024
Name of Course: Numerical Methods	Course Code:2404501
Max. Marks:60	Duration:2.30 Hrs.

Instructions: Candidates should read carefully the instructions printed on the Question Paper and on the cover page of the Answer Book, which is provided for their use.

1. This question paper contains 2 pages.
2. Answer to each new question is to be started on a new page.
3. Assume suitable data wherever required, but justify it.
4. The last columns indicates the Course Outcome of the Question/sub-question.

Marks CO

Question No. 1

1a) Determine the positive root of $2x^3$-3x+4=0 correct to three decimal places using Newton-Raphson method. Take initial value as -1.500. Also write the Python code for the above problem. (6) 1, 2

Question No. 2

2a) Given $\frac{dy}{dx} = 2x - 3y$ with initial condition y =1 at x = 0; find y for x = 0.5 by Euler's method. Take h = 0.1. (6) 1, 2

Question No. 3

3a) Evaluate $\int_0^1 \frac{dx}{x^2+1}$ by using Simpson's 1/3rd rule. Take h = 0.2. (8) 2, 3

OR

3b) Evaluate $\int_{0.5}^{1.5} e^{x^3} + 2x^2 + 3$ using five intervals by Trapezoidal rule. (8) 2, 3

3c) Evaluate $\int_0^6 \frac{dx}{1+2x+3x^2}$ using Simpson's 3/8th rule. Take h = 1. (8) 2, 3

OR

3d) Evaluate $\int_0^1 \int_0^1 x^2 + xy + y^2 \quad dxdy$ using double integration Trapezoidal rule. Take h = k = 0.25. (8) 2, 3

Question No. 4

4a) Using method of least squares, find the straight line that best fits the following data; (8) 3, 4

x	0	2	4	6	8
y	8	13	21	34	55

OR

4b) The following table gives the results of the measurements of x and y: (8) 3, 4

x	1	3	5	7	9
y	15	24	33	41	48

If y is related to x by the relation $y = a+bx+cx^2$, find a, b, c.

4c) Find the polynomial f(x) by using Lagrange's formula and hence find f(4) for; (8) 3, 4

x	1	3	5	7
y	6	10	14	18

OR

4d) For the values of x and y below, find f(40) using Linear Spline interpolation formula. (8) 3, 4

x	0	17	32	54
y	27	69	95	132

Question No. 5

5a) Find the cubic polynomial which takes the following values using Newton's forward interpolation formula: (8) 4, 5

x	0	1	2	3
f(x)	1	2	1	10

OR

5b) The below table gives the distances in nautical miles of the visible horizon for the given heights in feet above the earth's surface: (8) 4, 5

x(ht)	100	150	200	250	300	350	400
y(dist)	10.63	13.03	15.04	16.81	18.42	19.9	21.27

Find the values of y when x = 410ft using Newton's backward interpolation formula.

5c) Employ Stirling's formula to compute $y_{12.2}$ from the table, $y_x = 1 + \log_{10}\sin x$: (8) 4, 5

x	10	11	12	13	14
$10^5 y_x$	23967	28060	31788	35209	38368

OR

5d) Find f(22) from the Gauss forward formula: (8) 4, 5

x	20	25	30	35	40	45
y	354	332	291	260	231	204

····· End of question paper·····