



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

SUMMER-2024	
Exam Seat No.:	
Academic Year:2023-2024	Semester:I
Class:PG-I	Program:M.Tech
Branch Code:CIV	Pattern:2022
Name of Course:Numerical Methods in Structural Engineering	Course Code:CIV225101
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 3 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. Draw the neat labelled diagrams, wherever necessary.
5. The last columns indicates the Course Outcome and level of Blooms Taxonomy of the Question/sub-question.

Question No. 1 Attempt following Question

- 1a) Find the positive root of $x^3 - 3x + 1 = 0$ correct to three decimal places using Newton-Raphson method. Also write the Matlab code for the above problem. (6) CO1, CO2, CO5

Question No. 2 Attempt following Question

- 2a) Given $\frac{dy}{dx} = x + y$ with initial condition $y = 0$ at $x = 0$; find y for $x = 1.4$ by Euler's method. Take $h = 0.2$. (6) CO1, CO3

Question No. 3 Attempt following Question

- 3a) Evaluate $\int_0^1 \frac{dx}{1+x^2}$ by using Simpson's 1/3rd rule. Take $h = 0.25$. Also calculate error. (8) CO1, CO3, CO4

OR

- 3b) Evaluate $\int_{0.2}^{1.4} (\sin x - \log x + e^x) dx$ using six intervals by Trapezoidal rule. (8) CO1, CO3

- 3c) Evaluate $\int_0^9 \frac{dx}{1+x^2}$ using Simpson's 3/8th rule. Take $h = 1$. (8) CO1, CO3

OR

- 3d) Evaluate $\int_0^1 \int_0^1 e^{x+y} dx dy$ using double integration Trapezoidal rule. Take $h = k = 0.25$. (8) CO1, CO3

Question No. 4 Attempt following Question

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

(8) CO1,
CO3

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

OR

- 4b) The following table gives the results of the measurements of train resistances; V is the velocity in miles per hour. R is the resistance in pounds per ton. If R is related to V by the relation $R = a + bV + cV^2$, find a, b, c.

(8) CO1,
CO3

V	20	40	60	80	100	120
R	5.5	9.1	14.9	22.8	33.3	46

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

(8) CO1,
CO3

x	0	1	2	5
y	2	3	12	147

OR

- 4d) For the values of x and y below, find $f(80)$ using Linear Spline interpolation formula.

(8) CO1,
CO3

x	50	70	100	120
y	12	15	21	25

Question No. 5 Attempt following Question

- 5a) Find $f(22)$ from the Gauss forward formula:

(8) CO1,
CO3

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

OR

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

(8) CO1,
CO3

x	10	11	12	13	14
	23967	28060	31788	35209	38368

- 5c) The below table gives the distances in nautical miles of the visible horizon for the given heights in feet above the earth's surface. Find the values of y when $x = 410$ ft. using Newton's backward interpolation formula.

(8) CO1,
CO3

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

OR

- 5d) Find the cubic polynomial which takes the following values using Newton's forward interpolation formula:

(8) CO1,
CO3

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

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