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:III
Class:SY	Program:B.Tech
Branch Code:ROB	Pattern:2023
Name of Course:Numerical Methods	Course Code:2312206
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 04 page(s).
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.

Marks CO

Question No. 1

1a) A sample of 400 male students is found to have a mean height 67.47 inches . Can it be reasonably regarded as a sample from a large population with mean height 67.39 inches and standard deviation 1.30 inches ? Test at 5 % level of significance. (6) CO1

Question No. 2

2a) Set up an analysis of variance table for the following per acre production data for three varieties of wheat, each grown on 4 plots and state if the variety differences are significant. (6) CO2

Plot of land	*Per acre production data*		
	Variety of Wheat		
	A	B	C
1	6	5	5
2	7	5	4
3	3	3	3
4	8	7	4

Question No. 3

3a) Solve the equation, $xe^x - 3.1 (\cos x) = 0$, by Bisection method up to an accuracy of 0.01 (8) CO3

OR

3b) Find the fourth root of 32 , using Newton Raphson Method. Take accuracy 0.01 (8) CO3

3c) Solve the following set of simultaneous equations using Gauss elimination method. (8) CO3

$x + 3y + z = 10$

$x + 2y + 5z = 12$

$4x + y + 2z = 16$

OR

3d) Solve the following system of equations using Gauss Seidel method (8) CO3

$x_1 + 20x_2 + 9x_3 = -23$

$2x_1 - 7x_2 - 20x_3 = -57$

$20x_1 + 2x_2 + 6x_3 = 28$

Question No. 4

4a) Fit a curve $y = a\ x^b$ using the following data: (8) CO4

x	1	2	3	4	5
y	0.5	2.0	4.5	8	12.5

Find the values of a and b.

OR

4b) An experimental data on life time ‘t’ of cutting tool at a different cutting speeds ‘v’ is given below: (8) CO4

Speed , v	325	375	450	475	500
Life, t	75	30	10	7	5

Fit the curve of the form $v = a\ t^b$.

4c) Following data refers to the load lifted and corresponding force applied in a pulley system. If the load lifted and effort required are related by equation, (8) CO4
Effort = A x (Load lifted) + B, where ‘A’ and ‘B’ are constants.
Find The Values of A and B.

Load lifted in kN	10.0	15.0	20.0	25.0	30.0	35.0	40.0
Effort applied in kN	0.750	0.935	1.100	1.200	1.300	1.5	1.8

OR

4d) Obtain the line of regression for y on x for the data given below: (8) CO4

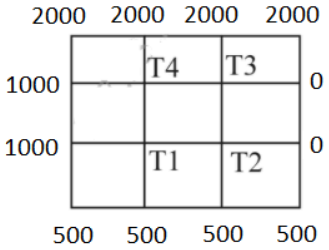
x	1.53	1.78	2.6	2.95	3.42	3.91	4.52
y	33.5	36.3	40	45.8	53.5	60	62

Question No. 5

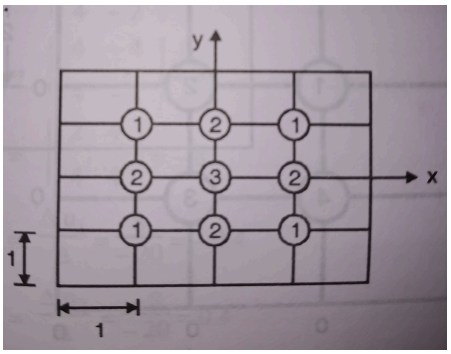
5a) A steel plate of 750×750 mm has its two adjacent sides maintained at 300 degree celsius while the two other sides are maintained at 0 degree Celsius. What will be the steady state temperature at interior points assuming a grid size of 250mm. (8) CO4

OR

5b) Solve the Laplace equation $\frac{\partial^2 T}{\partial x^2} + \frac{\partial^2 T}{\partial y^2} = 0$ for the square mesh as shown in diagram below. (8) CO4



5c) Solve the equation $\nabla^2 u = -8x^2 y^2$ in the domain of the figure shown below with f(x,y) = 0 on the boundary. (8) CO4



OR

5d) Solve the equation $\nabla^2 u = -10\,(x^2 + y^2 + 10)$ over the square with sides x=0=y, x=3=y with u= 0 on the boundary and mesh length = 1. (8) CO4

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