K. K. Wagh Institute of Engineering Education & Research, Nashik

(An Autonomous Institute From A.Y. 2022-23)

InSem Examination-I Winter2025	
Exam Seat No.:	
Academic Year:2025-2026	Semester:I
Class:FY	Program:B.Tech
Branch Code:FYE	Pattern:2023
Name of Course:Linear Algebra and Differential Calculus	Course Code:2300101A
Max. Marks:30	Duration:1.15Hrs.

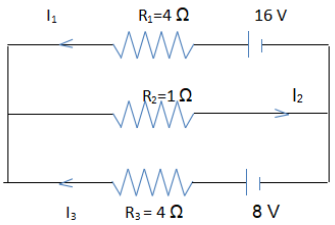
Instructions: Candidates should read carefully the instructions printed on the Question Paper and on the cover page of the Answer Book, which is provided for their use.

1. This question paper contains 2 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. Use of non-programmable pocket calculator is allowed.
6. The last columns indicates the Course Outcome and level of Blooms Taxonomy of the Question/sub-question.

Marks CO

Question No. 1

1 a) Determine the current in the network given in fig. (5) CO3



1 b) If A is orthogonal, find the value of λ, where A is (2) CO1

$$\mathbf{A} = \frac{1}{13}\begin{bmatrix} -12 & \lambda \\ \lambda & 12 \end{bmatrix}$$

Question No. 2

2 a) Are the vectors, $x_1 = (1, 2, 3)$, $x_2 = (3, -2, 1)$, $x_3 = (1, -6, -5)$ linearly dependent? If so, find the relation between them. (4) CO5

2 b) Examine for consistency and if consistent solve it. (4) CO2

$4x-2y+6z = 8$

$x+y-3z = -1$

$15x-3y+9z = 21$

Group OR

2 c) Express each of the transformations $x_1 = 3y_1+2y_2$, $x_2 = -y_1+4y_2$ and $y_1 = z_1+2z_2$, $y_2 = 3z_1$ in the matrix form and find the composite transformation which expresses x_1, x_2 in terms of z_1, z_2. (4) CO3

2 d) Investigate for what values of λ and μ, the system of equations (4) CO2

$x+y+z = 6$

$x+2y+3z = 10$

$x+2y+\lambda z = \mu$

have (1) No solution. (2) Infinite number of solutions.

Question No. 3

3 a) Reduce matrix A to diagonal form. Also write modal matrix & spectral matrix. (7) CO3

$$A = \begin{bmatrix} -2 & -8 & -12 \\ 1 & 4 & 4 \\ 0 & 0 & 1 \end{bmatrix}$$

Question No. 4

4 a) Find Eigen values & Eigen vectors of the matrix for the following matrix. (6) CO2

$$A = \begin{bmatrix} 1 & 1 & -2 \\ -1 & 2 & 1 \\ 0 & 1 & -1 \end{bmatrix}$$

4 b) Write the quadratic form in matrix notations, $Q(x) = 2x^2+5y^2+2xy-2yz+2xz$ (2) CO1

Group OR

4 c) Reduce the quadratic form $Q(x) = x_1^2+x_2^2+x_3^2-2x_1x_2$, to the canonical form by orthogonal transformation. Also find the index and signature. (6) CO5

4 d) Find Eigen values of A^3 where (2) CO1

$$A = \begin{bmatrix} 4 & 1 & 2 \\ 0 & -1 & 0 \\ 0 & 0 & 2 \end{bmatrix}$$

····· End of question paper·····