

DEPARTMENT OF MATHEMATICS

Course Code & Name : **23MAT101–MATRICES AND CALCULUS**

Course Faculty : **Ms.S.Sindhuja, AP/Mathematics**

Question Bank

Unit II- Orthogonal Transformation of a real symmetric matrix

Part A-Two Mark Questions

1	Can $(1\ 0\ 0\ 1)$ is diagonalizable. Why?	GATE-2016	L2
2	Write the matrix form of the quadratic form $6x^2 + 3y^2 + 3z^2 - 4xy - 2yz + 4xz$	GATE-2020	L1
3	Write the matrix of the quadratic form $2x^2 + 8z^2 + 4xy - 10xz - 2yz$	GATE-2016	L1
4	Find the nature of the quadratic form whose canonical form is $y_1^2 + y_2^2 + 4y_3^2$	GATE-2016	L1
5	Determine the nature of the quadratic form $x_1^2 + 2x_2^2$	GATE-2022	L1
6	If the Sum of the Eigen Values of the matrix of the quadratic form equal to zero, then what will be the nature of the quadratic form.	GATE-2020	L2
7	Show that $A = \begin{bmatrix} -1/3 & 2/3 & 2/3 \\ 2/3 & -1/3 & 2/3 \\ 2/3 & 2/3 & -1/3 \end{bmatrix}$ is orthogonal.	GATE-2021	L2
8	Find the Eigen values of $A = \begin{bmatrix} 1 & 3 & 4 \\ 0 & 2 & 5 \\ 0 & 0 & 3 \end{bmatrix}$. Also find its Rank and Index.	GATE-2016	L2

PartB -16MarkQuestions

1.	Reduce the matrix $A = \begin{pmatrix} 2 & 0 & 1 \\ 0 & 3 & 0 \\ 1 & 0 & 2 \end{pmatrix}$ to diagonal form through orthogonal transformation	GATE-2020	L2
2	Reduce the matrix $A = \begin{pmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{pmatrix}$ to diagonal form through orthogonal transformation	GATE-2022	L2
3	By an orthogonal transformation, reduce the matrix $A = \begin{pmatrix} 3 & 2 & 2 \\ 2 & 2 & 0 \\ 2 & 0 & 4 \end{pmatrix}$ to diagonal form.	GATE-2020	L2
4	By an orthogonal transformation, reduce the matrix $A = \begin{pmatrix} 6 & -2 & 2 \\ -2 & 3 & -1 \\ 2 & -1 & 3 \end{pmatrix}$ to diagonal form.	GATE-2019	L2
5	Reduce the quadratic form $8x^2 + 7y^2 + 3z^2 - 12xy - 8yz + 4zx$ to canonical form through orthogonal transformation and find its rank, index, signature and nature.	GATE-2016	L2
6	Find a change of variables that reduces the quadratic form $3x_1^2 + 5x_2^2 + 3x_3^2 - 2x_1x_2 + 2x_1x_3 - 2x_2x_3$ to a sum of squares and express the quadratic form in terms of new variables.	GATE-2022	L2
7	Reduce the quadratic form $2x_1x_2 + 2x_3x_2 + 2x_1x_3$ to canonical form through orthogonal transformation and find its rank, index, signature and nature.	GATE-2021	L2
8	Reduce the quadratic form $10x_1^2 + 2x_2^2 + 5x_3^2 - 4x_1x_2 + 6x_2x_3 - 10x_1x_3$ to canonical form through orthogonal transformation and find its rank, index, signature and nature.	GATE-2016	L2
9	An elastic membrane in the x_1, x_2 plane with boundary circle $x_1^2 + x_2^2 = 1$ is stretched so that a point $P(x_1, x_2)$ goes over in to the point $Q(x_1, x_2)$ given by $Y=AX$ where $A = \begin{pmatrix} 5 & 3 \\ 3 & 5 \end{pmatrix}$. Find the principal direction, that is, the direction of the position vector x of P for which the direction of the position vector y in Q is the same or exactly opposite. What shape does the boundary circle take under this deformation?	GATE-2022	L2