<u>191MA101 - Engineering Mathematics – I</u>

<u>QUESTIONS BANK</u>

<u>Unit – I MATRICES</u>

<u>Part – A(1 marks)</u>

1	If A is a square matrix such that $A^2 = A$, then $(I - A)^3 + A$ is equal to (a) I (b) 0 (c) I – A (d) I + A	CO1.1	K1
2	If A = $[a_{ij}]$ is a square matrix of order 2 such that $a_{ij} = 1$, when $i \neq j$ and $a_{ij} = 0$, when i = j, then A^2 is (a) $\begin{bmatrix} 1 & 0 \\ 1 & 0 \end{bmatrix}$ (b) $\begin{bmatrix} 1 & 1 \\ 0 & 0 \end{bmatrix}$ (c) $\begin{bmatrix} 1 & 1 \\ 1 & 0 \end{bmatrix}$ (d) $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$	CO1.4	K2
3	Total number of possible matrices of order 3 × 3 with each entry 2 or 0 is (a) 9 (b) 27 (c) 81 (d) 512	CO1. 1	K1
4	The matrix $\begin{bmatrix} 1 & 0 & 0 \\ 0 & 2 & 0 \\ 0 & 0 & 4 \end{bmatrix}$ is a (a) identity matrix (b) symmetric matrix (c) skew symmetric matrix (d) none of these	CO1.3	K2
5	If $A = \begin{bmatrix} 0 & 2 \\ 3 & -4 \end{bmatrix}$ & $kA = \begin{bmatrix} 0 & 3x \\ 2y & 24 \end{bmatrix}$ then the values of k , x and y respectively are (a) $-6, -12, -8$ (b) $-6, -4, -9$ (c) $-6,4,9$ (d) $-6,12,8$	CO1.3	K2
6	If $A = \begin{pmatrix} 0 & 0 & 1 \\ 0 & 1 & 0 \\ 1 & 0 & 0 \end{pmatrix}$ $then\ A^{-1} = ?$ (a) A (b) –A (c) I (d) –I	CO1.4	K2
7	If A,B are non singular square matrices of the same order, then $(AB^{-1})^{-1} =$ (a) BA^{-1} (b) $A^{-1}B^{-1}$ (c) AB^{-1} (d) AB	CO1. 4	K1
8	If A is a square matrix of order 3, $\lvert A' \rvert = -3$ $then$ $\lvert AA' \rvert =$ (a) 9 (b) -9 (c) 3 (d) -3	CO1.3	K1

9	If $A = \begin{bmatrix} 2 & 4 \\ 0 & 3 \end{bmatrix}$ $then\ A^{-1} =$ (a) $\begin{bmatrix} 3 & -4 \\ 0 & 2 \end{bmatrix}$ (b) $6\begin{bmatrix} 3 & -4 \\ 0 & 2 \end{bmatrix}$ (c) $\frac{1}{6}\begin{bmatrix} 3 & -4 \\ 0 & 2 \end{bmatrix}$ (d) $\frac{1}{6}\begin{bmatrix} 2 & 4 \\ 0 & 3 \end{bmatrix}$	CO1.4	K2
10	If $[2x \quad 3]\begin{bmatrix} 1 & 2 \\ -3 & 0 \end{bmatrix}\begin{bmatrix} x \\ 8 \end{bmatrix} = 0$ then the value of x is (a) 23/2 (b) 13/2 (c) – 13/2 (d) – 23/2	CO1. 3	K2
11	If $A = \begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}$ then the value of A^4 is (a) $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ (b) $\begin{bmatrix} 1 & 1 \\ 0 & 0 \end{bmatrix}$ (c) $\begin{bmatrix} 0 & 0 \\ 1 & 1 \end{bmatrix}$ (d) $\begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}$	CO1.4	K2
12	A square matrix A is called orthogonal if ----------- where A' is the transpose of A (a) $A = A^2$ (b) $A' = A^{-1}$ (c) $A = A^{-1}$ (d) $A = A'$	CO 1.5	K1
13	The matrix which follows the conditions $m = n$ is called? a) Square matrix b) Rectangular matrix c) Scalar matrix d) Diagonal matrix	CO 1.5	K1
14	Which of the following is a scalar matrix? (a) $\begin{bmatrix} 2 & 0 & 0 \\ 0 & 2 & 0 \\ 0 & 0 & 2 \end{bmatrix}$ (b) $\begin{bmatrix} 1 & 1 & 1 \\ 1 & 1 & 1 \\ 1 & 1 & 1 \end{bmatrix}$ (c) $\begin{bmatrix} 7 & 0 & 0 \\ 0 & 2 & 0 \\ 0 & 0 & 5 \end{bmatrix}$ (d) $\begin{bmatrix} 2 & 1 & 5 \\ 8 & 1 & 2 \\ 2 & 4 & 8 \end{bmatrix}$	CO1.3	K2
15	Which of the following expression is incorrect for matrix multiplication? a) $A(BC) = (AB)C$ b) $A(B + C) = AB + AC$ c) $AB = 0$ if either A or B is 0 d) $AB = BA$	CO1.3	K2
16	Which of the following expression holds true for a symmetric matrix? a) $A = -A'$ b) $A = A'$ c) $A = IA$ d) $A = \|A\|$	CO1.2	K2
17	Which of the following is the inverse of the matrix A=$\begin{bmatrix} 8 & 1 \\ 1 & 2 \end{bmatrix}$? (a) $\begin{bmatrix} \frac{2}{15} & \frac{-1}{15} \\ \frac{1}{15} & \frac{8}{15} \end{bmatrix}$ (b) $\begin{bmatrix} \frac{1}{15} & \frac{-1}{15} \\ \frac{-1}{15} & \frac{1}{15} \end{bmatrix}$ (c) $\begin{bmatrix} \frac{2}{15} & \frac{-1}{15} \\ \frac{-1}{15} & \frac{8}{15} \end{bmatrix}$ (d) $\begin{bmatrix} \frac{2}{15} & \frac{1}{15} \\ \frac{1}{15} & \frac{4}{15} \end{bmatrix}$	CO1 .4	K2
18	Find $\begin{vmatrix} -sin\theta & -1 \\ 1 & sin\theta \end{vmatrix}$ =.......... a) $\cos^2\theta$ b) $-\cos^2\theta$ c) $\cos 2\theta$ d) $\cos\theta$	CO 1.1	K2

19	Find the value of x if $\begin{vmatrix} 3 & x \\ 2 & x^2 \end{vmatrix} = \begin{vmatrix} 5 & 3 \\ 3 & 2 \end{vmatrix}$ (a) $x = 1, -\frac{1}{3}$ (b) $x = -1, -\frac{1}{3}$ (c) $x = 1, \frac{1}{3}$ (d) $x = -1, \frac{1}{3}$	CO 1.3	K2
20	Which of the following is not a property of determinant? a) The value of determinant changes if all of its rows and columns are interchanged b) The value of determinant changes if any two rows or columns are interchanged c) The value of determinant is zero if any two rows and columns are identical d) The value of determinant gets multiplied by k, if each element of row or column is multiplied by k	CO 1.3	K1
21	Inverse of a square matrix A is obtained by --------theorem. a) Cayley Hamilton's b)Rolles c) Euler d) Greens.	CO1.4	K1
22	" Every square matrix satisfies its own characteristic equation "is the statement of a) Cayley Hamilton's theorem b) Rolles theorem c) Euler theorem d) Greens theorem	CO 1.4	K1
23	If λ is the Eigen value of a square matrix A then $\frac{1}{\lambda}$ is the Eigen value of -------- a) A b)A^2 c) A^{-1} d) A^T	CO 1.3	K1
24	The Eigen values of a diagonal matrix are ----------- a) Elements of the first row b) Elements of the second row c) Elements of main diagonals d) None of these	CO 1.3	K1
25	If λ is the Eigen value of a square matrix A then λ^3 is the Eigen value of -------- a) A^3 b)A^2 c) A^{-1} d) A^T	CO1.3	K1

Part - B (4 marks)

1	Find the eigen values and eigen vectors of the matrix $A = \begin{bmatrix} 2 & 2 & 0 \\ 2 & 1 & 1 \\ -7 & 2 & -3 \end{bmatrix}$	CO1.2	K3
2	Verify Cayley - Hamilton theorem for the matrix $A = \begin{bmatrix} 1 & 2 & 3 \\ 2 & 4 & 5 \\ 3 & 5 & 6 \end{bmatrix}$.	CO1.4	K3
3	Find the eigen values and eigen vectors of the matrix = $\begin{bmatrix} 11 & -4 & -7 \\ 7 & -2 & -5 \\ 10 & -4 & -6 \end{bmatrix}$.	CO1.2	K3
4	Verify Cayley - Hamilton theorem for the matrix $A = \begin{bmatrix} 6 & -6 & 5 \\ 14 & -13 & 10 \\ 7 & -6 & 4 \end{bmatrix}$.	CO1.4	K3
5	Find the eigen values and eigen vectors of the matrix $A = \begin{bmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{bmatrix}$	CO1.2	K3
6	Find the eigen values and eigen vectors of the matrix $A = \begin{bmatrix} 2 & 1 & 1 \\ 1 & 2 & 1 \\ 0 & 0 & 1 \end{bmatrix}$.	CO1.2	K3
7	Write the statement and applications of Cayley –Hamilton theorem.	CO 1.4 &1.7	K1
8	Write any four properties of Eigen values.	CO 1.3	K1
9	Mention any four applications of Eigen values and Eigen vectors .	CO1.7	K1
10	Prove that if λ is the Eigen value of A then λ^n is the Eigen value of A^n .	CO1.3	K2

Part – C(12 marks)

1	Reduce the quadratic form $3{x_1}^2 + 3{x_2}^2 + 3{x_3}^2 + 2x_1x_2 + 2x_1x_3 - 2x_2x_3$ to canonical form through an orthogonal transformation.	CO 1.6	K3
2	Use Cayley – Hamilton theorem find $A^4 and\ A^{-1}$, if $A = \begin{bmatrix} 1 & 1 & 3 \\ 1 & 3 & -3 \\ -2 & -4 & -4 \end{bmatrix}$	CO1.4	K3
3	Reduce the quadratic form $Q = 6x^2 + 3y^2 + 3z^2 - 4xy - 2yz + 4xz$ canonical form by an orthogonal reduction. Hence find its nature.	CO 1.6	K3
4	Use Cayley – Hamilton theorem to find the value of the matrix given by $f(A) = A^8 - 5A^7 + 7A^6 - 3A^5 + A^4 - 5A^3 + 8A^2 - 2A + I$ if $A = \begin{pmatrix} 2 & -1 & 2 \\ -1 & 2 & -1 \\ 1 & -1 & 2 \end{pmatrix}$.	CO1.4	K3

5	Reduce the quadratic form ${x_1}^2 + 5{x_2}^2 + {x_3}^2 + 2x_1x_2 + 6x_1x_3 + 2x_2x_3$ to canonical form through an orthogonal transformation. Also find its nature, index, rank and signature.	CO 1.6	K4
6	Use Cayley – Hamilton theorem find $A^4 and\ A^{-1}$, if $A = \begin{bmatrix} 1 & 2 & 3 \\ 2 & 2 & 1 \\ 1 & 1 & 3 \end{bmatrix}$.	CO 1.4	K3
7	Reduce the quadratic form $2xy - 2yz + 2xz$ to canonical form by orthogonal reduction. Also find its nature, index, rank and signature.	CO 1.6	K3
8	Diagonalize the Matrix $A = \begin{bmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{bmatrix}$	CO1.5	K3