Total No. of Questions : 3]

SEAT No. :

PA-996

[5902]-13

F.Y. B.Sc. (Computer Science) MATHEMATICS MTC-111 : Matrix Algebra (2019 Pattern) (Semester - I) (Paper-I)

Time : 2 Hours]

[Max. Marks : 35

[10]

[Total No. of Pages : 2

Instructions to the candidates:

- 1) All questions are compulsory.
- 2) Figures to the right indicate full marks.
- 3) Use of single memory, non programmable scientific calculator is allowed.

Q1) Attempt any Five of the following.

- a) Let $A = \begin{bmatrix} 4 & -1 \\ 5 & -2 \end{bmatrix}$. Compute $3I_2 A_2$.
- b) Is the matrix $A = \begin{bmatrix} 6 & -9 \\ -4 & 6 \end{bmatrix}$ invertible? Justify.
- c) Determine whether the given system is consistent.



What is the condition on matrix A, So that the homogeneous system of linear equations Ax = 0 has non-trivial solution?

- e) Let $T : \mathbb{R}^3 \to \mathbb{R}^2$ be a linear transformation. Find the standard matrix of T, if $T(\overline{e_1}) = (1, 3)$, $T(\overline{e_2}) = (4, -7)$ and $T(\overline{e_3}) = (-5, 4)$, where $\overline{e_1} = (1, 0, 0)$, $\overline{e_2} = (0, 1, 0)$ and $\overline{e_3} = (0, 0, 1)$.
- f) What is the rank of a 4×5 matrix, whose null space is 3 dimensional?

g) Does the vector
$$[X] = \begin{bmatrix} 2 \\ 1 \end{bmatrix}$$
 belong to Null A, where $A = \begin{bmatrix} 1 & -2 \\ -2 & 4 \end{bmatrix}$?
PTO.

Q2) Attempt any three of the following.

- Find the volume of parallelopiped with one vertex at origin and adjacent a) vertices are (1, 4, 0), (-2, -5, 2) and (-1, 2, -1).
- Solve the system of linear equations. b) $x_1 - 3x_2 + 4x_3 = -4$ $3x_1 - 7x_2 + 7x_3 = -8$ $3x_1 - ix_2 - x_3 = 7$ Determine whether $\overline{u} = \begin{bmatrix} 2 \\ -1 \\ 6 \end{bmatrix}$ is a linear combination of $\overline{u}_1 = \begin{bmatrix} 1 \\ -2 \\ 0 \end{bmatrix}, \ \overline{u}_2 = \begin{bmatrix} 0 \\ 1 \\ 2 \end{bmatrix}$ c) , s. 0 and $\overline{u}_3 = \begin{bmatrix} 5 \\ -6 \\ 9 \end{bmatrix}$. d) Find a basis for null space of A. Where $A = \begin{bmatrix} -3 & 6 & -1 & 1 & -7 \\ 1 & -2 & 2 & 3 & -1 \\ 2 & -4 & 5 & 8 & -4 \end{bmatrix}$ Determine whether the vectors $\overline{v}_1 = \begin{bmatrix} 0 \\ 0 \\ 2 \end{bmatrix}$, $\overline{v}_2 = \begin{bmatrix} 0 \\ 5 \\ -8 \end{bmatrix}$ and $\overline{v}_3 = \begin{bmatrix} -3 \\ 4 \\ 1 \end{bmatrix}$ are e) linearly independent in R³.

Q3) Attempt any one of the following.

a) Convert the matrix
$$A = \begin{bmatrix} 3 & -7 & -2 \\ -3 & 5 & 1 \\ 6 & -4 & 0 \end{bmatrix}$$
 into LU factorization and use it to solve $Ax = b$, where $b = \begin{bmatrix} -7 \\ 5 \\ 2 \end{bmatrix}$.

- Show that T : $\mathbb{R}^2 \to \mathbb{R}^2$ defined by T(x, y) = (x + y, x y) is a linear b) transformation.
- Prove that the set $S = {\overline{u_1}, \overline{u_2}}$ is linearly dependent if and only if one c) vector is a scalar multiple of the other.

[5902]-13

2