

[6502]-3

F.Y. B.Sc. (Computer Science)

MATHEMATICS

MTC-101-T: Matrix Algebra

(NEP) (Rev. 2024) (Semester - I)

Time : 2 Hours]

[Max. Marks : 30

Instructions to the candidates:

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

Q1) Attempt any five of the following.

[5 × 2 = 10]

- a) Define symmetric matrix. Give one example of symmetric matrix.
- b) If $A = \begin{bmatrix} 8 & 6 \\ 5 & 4 \end{bmatrix}$, then find determinant of matrix A.
- c) State any two properties of determinant.
- d) For the following system of linear equation, write the matrix form $AX = B$

$$5x + 3y + 7z = 4$$

$$3x + 26y + 2z = 9$$

$$7x + 2y + 10z = 5$$
- e) If $A = \begin{bmatrix} 0 & 1 \\ -1 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} 5 & 1 \\ -2 & 3 \end{bmatrix}$, then find $5A + 3B$.
- f) If A is 5×7 matrix and nullity (A) = 4, then find rank of A.
- g) Describe the nature of solution for the following system of linear equation.

$$x + 2y = 5$$

$$7x + 14y = 35$$

P.T.O.

Q2) Attempt any two of the following.

[2 × 5 = 10]

- a) Verify that $\det(A, B) = \det(A) \det(B)$ for the following matrices.

$$A = \begin{bmatrix} 1 & 1 \\ -1 & 3 \end{bmatrix} \text{ and } B = \begin{bmatrix} 4 & 2 \\ -2 & 3 \end{bmatrix}$$

- b) By elementary row transformation, reduce the following matrix into

row Echelon form. $A = \begin{bmatrix} 1 & 2 & 1 \\ 3 & 2 & 3 \\ 1 & 1 & 2 \end{bmatrix}$

- c) Use Cramer's rule of compute system of linear equation

$$2x + 8y = 18$$

$$2x + 2y + 3z = 3$$

$$x + 2y + 7z = 12$$

- d) Find the inverse of Matrix $A = \begin{bmatrix} 2 & 1 & 3 \\ 1 & 1 & 1 \\ 1 & 4 & -2 \end{bmatrix}$ by adjoint method.

Q3) Attempt any one from the following.

[1 × 10 = 10]

- a) Use LU-Decomposition of A to solve $AX = b$ where

$$A = \begin{bmatrix} 3 & -7 & -2 \\ -3 & 5 & 1 \\ 6 & -4 & 0 \end{bmatrix} \text{ and } B = \begin{bmatrix} -7 \\ 5 \\ 2 \end{bmatrix} \text{ and } X = \begin{bmatrix} x \\ y \\ z \end{bmatrix}$$

- b) i) Solve the following system of equation by Gauss elimination method.

$$x + 2y + 3z = 1$$

$$4x + 5y + 6z = 2$$

$$7x + 8y + 9z = 0$$

- ii) Find the inverse of the matrix $A = \begin{bmatrix} 1 & -2 & -1 \\ -1 & 5 & 6 \\ 5 & -4 & 5 \end{bmatrix}$, If it exist. Use row transformation method.

