

S.Y. CS Sem. III Linear Algebra.

DURATION: - 2½ hrs

832081123

MARKS:- 75

Note: - (1) All questions are compulsory.
 (2) All questions carry equal marks.
 (3) Figures to the right indicates full marks.

Q.1 Attempt any 'Four' of the following: (20)

1. Write a python program to rotate a complex number by 90°, 180° and 270° CO1 (A)
2. Express the following in the standard form of complex number CO1 (U)
 - a) $\frac{2 - \sqrt{3}i}{1 + i}$ b) $\frac{1 + i}{1 - i}$
3. Express the following in polar form and find their arguments CO1 (U)
 - a) $\frac{1 + 2i}{1 - 3i}$ b) $\frac{-1}{2} + i\frac{\sqrt{3}}{2}$
4. For $u = [0, 1, 1]$ and $v = [1, 1, 1]$ over $GF(2)$, CO1 (A)
 Find $v + u$ and $v + 2u$ and $2v - 3u$
5. Two vectors are given as $\vec{r} = 2\hat{i} + 3\hat{j} + 5\hat{k}$, $\vec{r} = 3\hat{i} - 2\hat{j} + 4\hat{k}$, find the resultant CO1 (A)
 vector $\vec{r} = \vec{r} \times \vec{r}$ and its magnitude.
6. Check whether the given system of linear equation is consistent or not. CO1 (U)
 $2x + y + z = 5$; $x + y + z = 4$; $x - y + 2z = 1$

Q.2 Attempt any 'Four' of the following (20)

1. Compute the following vector - matrix product CO2 (U)
 - a) $\begin{bmatrix} 0 \\ 4 \\ 6 \end{bmatrix} \cdot \begin{bmatrix} 1 & 2 \\ 4 & 9 \\ -1 & -10 \end{bmatrix}$ b) $[0, 1, 2] \cdot \begin{bmatrix} 1 & 2 \\ 3 & -1 \\ 2 & 6 \end{bmatrix}$
2. Check whether given vectors are linearly dependent or not CO2 (A)
 $(2, 2, 1), (-4, 6, 5), (1, 0, 0)$
3. Using the normal form of Row transformation find the rank of the matrix, CO2 (A)
 $A = \begin{bmatrix} 1 & 2 & 3 \\ 2 & 3 & 4 \\ 3 & 5 & 7 \end{bmatrix}$
4. Find rank of matrix using Echelon form, $A = \begin{bmatrix} 1 & 1 & 1 & -2 \\ 2 & 3 & 1 & 2 \\ 2 & 6 & 2 & -2 \\ 1 & 2 & 3 & 1 \end{bmatrix}$ CO2 (A)
5. Write a python program to convert a 2X2 matrix to row echelon form. CO2 (A)
6. If $V_1 = [1, 2, 2, -1]$, $V_2 = [1, 3, 1, 1]$, $V_3 = [1, 5, -1, 5]$, $V_4 = [1, 1, 4, -1]$ and $V_5 = [2, 7, 0, 2]$ Find the basis for the subspace spanned by these vectors. CO2 (A)

Q.3 Attempt any 'Four' from the following (20)

1. Write a python program to enter a matrix and check if it is invertible. If invertible exists, then find uiverse CO3 (A)
2. If $A = \begin{bmatrix} 1 & -1 & 2 \\ 2 & 3 & 0 \\ 4 & 1 & -2 \end{bmatrix}$ find A^{-1} using adjoint method. CO3 (U)

3. For each of the matrix-vector equations check whether the solution exist or not? CO3 (U)

If it exists then solve

$$\begin{bmatrix} 1 & 2 & -8 & -4 & 0 \\ 0 & 0 & 2 & 12 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{bmatrix} * [x_1, x_2, x_3, x_4, x_5] = [5, 4, 0, 0]$$

4. Solve the following system by Gaussian elimination method CO3 (U)

$$2x - y + 3z = 9; \quad x + y + z = 6; \quad x - y + z = 2$$

5. Find eigen values and eigen vectors for $\begin{bmatrix} 3 & -17 \\ 0 & 24 \end{bmatrix}$ CO3 (A)

6. Show that $A = \begin{bmatrix} 1 & 2 & 3 \\ 0 & 2 & 0 \\ 0 & 0 & 2 \end{bmatrix}$ is not diagonalizable. CO3 (A)

Q.4

Attempt any 'Five' of the following :

(15)

1. Calculate the absolute value of $2 - 5i$ CO3 (U)
2. Find the standard form of a complex number if $\frac{2-3i}{3-2i}$ we have. CO3 (U)
3. Find the A^{-1} if exist, $A = \begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{bmatrix}$ CO3 (A)
4. Write a short noe on internet worm. CO3 (A)
5. Find the minimal polynomial of $A = \begin{bmatrix} 3 & -1 & 0 \\ 0 & 2 & 0 \\ 1 & -1 & 2 \end{bmatrix}$ CO3 (U)
6. Define the term inner product space CO3 (R)
