

BACHELOR OF TECHNOLOGY (CBCS - 2023)
B. Tech. Sem-II COMPUTER SCIENCE & BUSINESS SYSTEMS : SUMMER : 2024
SUBJECT: LINEAR ALGEBRA

Day : Tuesday
 Date : 21/05/2024

S-27707-2024

Time : 10:00 AM-01:00 PM
 Max. Marks : 60

N.B.

- 1) All questions are **COMPULSORY**.
- 2) Figures to the right indicate **FULL** marks.
- 3) Assume suitable data **WHEREVER** necessary.
- 4) Draw neat diagrams **WHEREVER** necessary.

Q.1 Solve the following equation by using Cramer's rule (10)
 $\bar{x} + y + z = 6, 2x + \bar{y} - 2z = -2, x + y - 3z = -6.$

OR

Q.1 If $\begin{vmatrix} x & x^2 & 1+x^3 \\ y & y^2 & 1+y^3 \\ z & z^2 & 1+z^3 \end{vmatrix} = 0.$ (10)

Then without expanding the determinant prove that $xyz = -1$. Where x, y, z are unequal.

Q.2 Find the rank of $A = \begin{bmatrix} 1 & 2 & 3 & 4 \\ 2 & 1 & 4 & 3 \\ 3 & 0 & 5 & -10 \end{bmatrix}.$ (10)

OR

Q.2 Solve $4x - 2y + 6z = 8, x + y - 3z = -1, 15x - 3y + 9z = 21.$ (10)

Q.3 Determine whether or not the following set S of vectors form a basis of \mathbb{R}^3 . $S = \{v_1 = (1, 1, 2), v_2 = (1, 2, 5), v_3 = (5, 3, 4)\}.$ (10)

OR

Q.3 Let W be the subspace of \mathbb{R}^4 spanned by vectors $u_1 = (1, -2, 5, -3), u_2 = (2, 3, 1, -4), u_3 = (3, 8, -3, -5).$ Find a basis and dimension of W . (10)

Q.4 Find a QR factorization of $A = \begin{bmatrix} 1 & -4 \\ 2 & 3 \\ 2 & 2 \end{bmatrix}.$ (10)

OR

Q.4 Apply the Gram-Schmidt process to obtain an orthogonal basis. Then normalize this basis to obtain an orthonormal basis. $x_1 = (1, -1, -1), x_2 = (0, 3, 3), x_3 = (3, 2, 4)$ (10)

Q.5 Find the Eigen values and the corresponding Eigen vectors of $A = \begin{bmatrix} -1 & 1 & 2 \\ 0 & -2 & 1 \\ 0 & 0 & -3 \end{bmatrix}.$ (10)

OR

Q.5 Determine whether the given matrix is Hermitian or not $A = \begin{bmatrix} 3 & 2-i & 4+i \\ 2-i & 6 & i \\ 4+i & i & 7 \end{bmatrix}.$ (10)

Q.6 Find a singular value decomposition of $A = \begin{bmatrix} 1 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}.$ (10)

OR

Q.6 Give the following data, use principal component analysis to reduce the dimension from 2 to 1. (10)

Feature	Example1	Example2	Example3	Example4
X	4	8	13	7
Y	11	4	5	14
