BACHELOR OF TECHNOLOGY (CBCS - 2023)

B. Tech. Sem-II Computer Science & Business Systems : WINTER : 2024

SUBJECT: LINEAR ALGEBRA

Day : Saturday

Date : 30/11/2024

W-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)**
$x+y+z=6,\ 3x+3y+z=12,\ 2x+3y+2z=14.$

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 $A=\begin{bmatrix} 2 & -2 & 0 & 6 \\ 4 & 2 & 0 & 2 \\ 1 & -1 & 0 & 3 \\ 1 & -2 & 1 & 2 \end{bmatrix}.$ **(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 R^4. $S=\{(1,1,1,1),\ (1,2,3,2),\ (2,5,6,4),(2,6,8,5)\}$. **(10)**

OR

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

Q.4 Apply the Gram-Schmidt orthogonalization process to find an orthogonal basis and then an orthonormal basis for the subspace U of R^4 spanned by **(10)**
$v_1=(1,1,1,1),\ \ v_2=(1,2,4,5),\ v_3=(1,-3,-4,-2)$.

OR

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

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

OR

Q.5 Determine whether the given matrix is Hermitian $A=\begin{bmatrix} 4 & -3 & 5 \\ -3 & 2 & 1 \\ 5 & 1 & -6 \end{bmatrix}.$ **(10)**

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

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