BACHELOR OF TECHNOLOGY (CBCS) (2021-COURSE)
Computer Science & Business Systems
B. Tech. Sem - II :SUMMER : 2023
SUBJECT : LINEAR ALGEBRA

Day : Monday
Date : 22-05-2023
Time : 10:00 AM-01:00 PM
S-24136-2023
Max. Marks : 60

N.B.

1) All questions are **COMPULSROY.**
2) Figures to the right indicate **FULL** marks.
3) Use of non-programmable calculator is allowed.

Q.1 Solve: **(10)**

$$3x + y + 2z = 3$$
$$2x - 3y - z = -3$$
$$x + 2y + z = 4$$

By **i)** Determinants **ii)** Matrices.

OR

Q.1 Show that **(10)**

$$\begin{vmatrix} a^2+\lambda & ab & ac & ad \\ ab & b^2+\lambda & bc & bd \\ ac & bc & c^2+\lambda & cd \\ ad & bd & cd & d^2+\lambda \end{vmatrix} = \lambda^3\left(a^2+b^2+c^2+d^2+\lambda\right)$$

Q.2 Find the LU-factorization of: **(10)**

$$\begin{bmatrix} 1 & -3 & 5 \\ 2 & -4 & 7 \\ -1 & -2 & 1 \end{bmatrix}$$

OR

Q.2 Solve: **(10)**

$$2x_1 + x_2 + 2x_3 + x_4 = 6$$
$$6x_1 - 6x_2 + 6x_3 + 12x_4 = 36$$
$$4x_1 + 3x_2 + 3x_3 - 3x_4 = -1$$
$$2x_1 + 2x_2 - x_3 + x_4 = 10$$

Q.3 Find basis and dimension of subspace W of P(t) spanned by **(10)**

$$U = t^3 + 2t^2 - 2t + 1,$$
$$V = t^3 + 3t^2 - 3t + 4$$
$$W = 2t^3 + t^2 - 7t - 7$$

OR

Q.3 Let W be the subspace of R^5 spanned by the vectors **(10)**
$U_1 = (1,2,-1,3,4)$, $U_2 = (2,4,-2,6,8)$, $U_3 = (1,3,2,2,6)$,
$U_4 = (1,4,5,1,8)$, $U_5 = (2,7,3,3,9)$
find a subset of vectors that forms a basis of W..

P.T.O.

Q.4 Find a QR factorization of (10)

$$\begin{bmatrix} 1 & 2 & 2 \\ -1 & 1 & 2 \\ -1 & 0 & 1 \\ 1 & 1 & 2 \end{bmatrix}$$

OR

Q.4 Apply Gram-Schmitt orthogonalization process to find an orthogonal basis and orthonormal basis for the subspace U of R^4 spanned by $U_1 = (1,1,1,1), U_2 = (1,2,4,5), U_3 = (1,-3,-4,-2)$. (10)

Q.5 Find eigen values and eigen vectors of (10)

$$A = \begin{bmatrix} 2 & 4 & -6 \\ 4 & 2 & -6 \\ -6 & -6 & -15 \end{bmatrix}$$

OR

Q.5 Show that (10)

$$A = \begin{bmatrix} 3 & 7-4i & -2+5i \\ 7+4i & -2 & 3+i \\ -2-5i & 3-i & 4 \end{bmatrix}$$

is Hermitian matrix .

Q.6 Find singular valued decomposition of (10)

$$A = \begin{bmatrix} 1 & -1 \\ -2 & 2 \\ 2 & -2 \end{bmatrix}$$

OR

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

Feature	Example 1	Example 2	Example 3	Example 4
x	4	8	13	7
y	11	4	5	14

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