Q.P. Code: 00005357

[Time:2.30 Hrs] **[Marks:75]**

Please check whether you have got the right question paper.

N.B: 1. All question are compulsory.
2. Figures to the right indicate full marks.

Q.1 Attempt any four of the following: **20**

A Find the square root of Z =3-4i

B If Z1 = 5 - 12i and Z2 = 8 + 6i, Find the values of Z1 + Z2 , Z1 - Z2, Z1 * Z2, and Z1 / Z2.

C Find the conjugate, modulus and argument of the following complex numbers: Z = 8 - 6i

D Show that the subset S = {(1, 0, 0), (0, 1, 0), (0, 0, 1)} of V3 spans the entire vector space V3.

E Explain Dot product and Cross Product

F Express W = (6, -2, 5) as a linear combination of
v1 = (−2, 1, 3) and v2 = (3, 1, -1) and v3 = (-1, -2, 1).

Q.2 Attempt any four of the following: 20

A Explain Inner product & outer product

B Compute the following matrix-vector products M = $\begin{bmatrix} 1 & -1 & 2 \\ 0 & 1 & -2 \end{bmatrix}$ and v = [2, −3, 0] -

C Compute Matrix Matrix Multiplication : $\begin{bmatrix} 2 & 2 \\ 4 & 3 \end{bmatrix} \begin{bmatrix} 1 & -1 \\ 1 & 1 \end{bmatrix}$

D Let V = Span {[0, 0, 1], [1, 0, 1], [2, 1, 1]}. For each of the following vectors, show it belongs to V by writing it as a linear combination of the generators of V. a) [2, 1, 4]

E Verify Rank – Nullity theorem T : ℝ2 → ℝ2 defined by T(x, y) = x+y

F For each of the set given below, show the given vectors over R are linearly dependent.
[1, 2, 0], [2, 4, 1], [0, 0, −1]

Q.3 Attempt any four of the following: 20

A Solve the following system of equations by Gaussian elimination method:
2x + y + z =10; 3x + 2y + 3z =18; x + 4y + 9z = 16

B Find (26,118) and express it in the form 26x+118y, where x and y ∈

C State Cauchy-Schwartz inequality.

D Find the vector orthogonal to both u = (-6, 4, 2) and v = (3, 1, 5).

E Find the characteristic equation and hence Eigen values for A= $\begin{bmatrix} 1 & 3 \\ 4 & 3 \end{bmatrix}$.

F Find a matrix P which transforms the matrix $A = \begin{bmatrix} 1 & 1 & 3 \\ 1 & 5 & 1 \\ 3 & 1 & 1 \end{bmatrix}$ to diagonal form

Q.4 Attempt any three of the following: 15

A Express W= (4, 3) as a linear combination of v Vectors v1=(2, 3) and v2 = (0, 1).

B Solve in GF(2): i.) 1+1+0+1+1 ii.) 1.1.1+0.1.1+1.1.1+0.0.0

C Explain minimum spanning Forest and Gf (2)

D Determine whether the following set of vectors span vector space R 3 , v1=(2, 2, 2) , v2=(0, 0, 3) , v3=(0, 1, 1)

E Let v1, v2, …… , vn be mutually orthogonal vectors. Then, ||v1 + v2+, … + vn || 2 = ||v1|| 2 + ||v2|| 2 + ⋯ + ||vn|| 2

F Let W be a subset of vector space V. Prove that W⊥ is a subspace of Rn .

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