

**Indian Institute of Information Technology Sri City (IIITS)**

Name of the Exam: DSMA End Sem

Duration: 1.5 hrs

Max. Marks: 25

**Instructions:**

1. All questions are mandatory.
2. Marks are indicated in [ ] after each question.
3. Rough Work should be done separately, not in the answer sheet.
4. Answers should be reasoned and derived clearly, not a single word answer.

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- Q1. a) Draw the Hasse Diagram for the partial ordering  $\{(A, B) | A \text{ is subset of } B\}$  on the power set  $P(S)$ , where  $S = \{1, 2, 3\}$ .  
b) Find the Maximal elements.  
c) Find the Minimal elements.  
d) Find the greatest and the least element.  
e) Find the upper bounds of  $\{\{1\}, \{2\}\}$  and also find its least upper bound if it exists.

[2+1+1+1+1]

- Q2. Solve the following system of equations by Gaussian Elimination method.

[4]

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

$$4x + 9y - 3z = 8$$

$$-2x - 3y + 7z = 10$$

Q3. Suppose we have a matrix  $A = \begin{pmatrix} 2 & 4 & 5 & -2 \\ -4 & -8 & -10 & 1 \\ 2 & 4 & 7 & 8 \\ -6 & -12 & -11 & 1 \end{pmatrix}$

(a). Find a LU factorization for A. [4]

(b). What is the Rank of A ? [1]

Q4. Show that  $W = \{(x, y) \in R^2; x + y = 0\}$  is a subspace of  $R^2$ . [2]

Q5. Prove that the set of vectors  $\{(1,5), (5,1)\}$  is linearly independent in  $R^2$ . [1]

Q6. Given the following vectors in  $R^3$ ,

$$\left( \begin{array}{c} 1 \\ 1 \\ -2 \end{array} \right), \left( \begin{array}{c} 1 \\ 2 \\ -3 \end{array} \right), \left( \begin{array}{c} 0 \\ 1 \\ 1 \end{array} \right)$$

use Gram-Schmidt process to obtain three orthonormal vectors. [4]

Q7. Find Eigenvalues and Eigenvectors of the following matrix A.

$$\mathbf{A} = \begin{bmatrix} 0 & 1 \\ -2 & -3 \end{bmatrix}$$

[1+2]