

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 $\{(A, B) \mid A \text{ is subset of } B\}$ 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 $W = \{(x, y) \in \mathbb{R}^2 : x + y = 0\}$ is a subspace of \mathbb{R}^2 .

[2]

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

[1]

Q6. Given the following vectors in \mathbb{R}^3 ,

$$\begin{pmatrix} 1 \\ 1 \\ -2 \end{pmatrix}, \begin{pmatrix} 1 \\ 2 \\ -3 \end{pmatrix}, \begin{pmatrix} 0 \\ 1 \\ 1 \end{pmatrix}$$

use Gram-Schmidt process to obtain three orthonormal vectors.

[4]

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

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

[1+2]