IIITS/DSMA **End Exam Date: March 2022**

Indian Institute of Information Technology, Sri City, Chittoor

Name of the Exam: DSMA End Examination **Duration: 1.5 hrs**

Max. Marks: 20

Group 6

Instructions: (Please read all of them carefully before attempting the questions)

1. **Write the answers in A4 sheets. You are required to clearly write your roll number, name and question paper code in capital letters on the top right corner of every page of the answer sheets. It is mandatory.**
2. **At the end of the exam, you are expected to upload the scanned copy of the hand written answer sheets in one consolidated PDF format using the google form sent by the instructor as per the indicated closing time. Do not mail answer-sheets.**
3. **All questions are mandatory.**
4. **Marks are indicated after each question.**
5. **Rough Work should be done separately, not in the answer sheet.**
6. **Answers should be reasoned and derived clearly, not a single word answer.**
7. **You may write the answers preferably using a Ballpoint pen (Preferably Blue). The writing should be readable after scanning. (This is very important)**
8. **Copying in any form will be dealt strictly.**
9. **This is a proctored exam. You need to keep your video on throughout the exam.**
10. **Please note that the total time of the written exam is 1.5 hours (after that ten minutes for scanning and uploading). Manage your time accordingly. No submissions are entertained after 1 hour 40 minutes.**

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1. a) Solve the following recurrence relation:

$S_{n+2} + 3S_{n+1} + 2S_n = 3^n$ for $n \geq 0$ with $S_0=1$ and $S_1=1$ [3 Marks]

b) Let S be given by span{[1,-1,1],[1,0,1]}.

Find orthonormal basis of S and $S^{\perp}$ (orthogonal complement of S). [Span{x,y} indicates the space spanned by x and y]
[2+2 Marks]

2	(a) [3 Marks] Find the dimensionality of the column space of $A_{4\times 4} = \begin{bmatrix} 1 & -1 & 0 & 1 \\ -1 & -1 & -2 & -3 \\ -1 & -1 & -2 & -3 \\ 1 & -1 & 0 & 1 \end{bmatrix}$ (b) [4 Marks] Find projection matrix to project a vector onto the null space of the matrix $A = \begin{bmatrix} 1 & 1 & 2 \\ 2 & 1 & 1 \end{bmatrix}$

3. Let A={2,3,5,10,11,15,25} and R be the partial ordering on A defined by aRb if a divides b. [3 Marks]

(a) Determine the relational matrix(zero one matrix) for R

(b) Draw the Hasse diagram of the poset (A,R)

(c) Find its maximal, minimal elements. Is there a greatest and a least element?

4. Let R be a relation on A={1,2,3,4,5,6,7,8,9,10,12} defined by xRy if and only if x-y is a multiple of 4. [3 Marks]

(a) Verify whether R is an equivalence relation on A

(b) Determine the equivalence classes and partition of A induced by R