DSMA (M2021) EndSem – Group 2 – 20 Marks

1. (a) [3 Marks] Solve the following recurrence relation:

$S_{n+2} - 4S_{n+1} + 3S_n + 200 = 0$ for $n \geq 0$ with $S_0=3000$ and $S_1=3300$.

(b) [2+2 Marks] Let S be given by span{[1,1,1],[1,0,2]}.
Find orthonormal basis of S and $S^{\perp}$ (orthogonal complement of S). [Span{x,y} indicates the space spanned by x and y]

2. [3 Marks] Let A = {1,2,3,5,7,11,13} 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?

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

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

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

4.(a)[3 Marks] Find Null Space of matrix A given below. Clearly show pivot columns and free columns and thus give your solution.

$$A = \begin{bmatrix} 3 & 1 & 11 \\ 2 & 1 & 6 \\ 1 & 0 & 5 \end{bmatrix}$$

(b) [4 Marks] The equation Ax = b may not have a solution if b is not in C(A). But the projection of b onto C(A) gives the best possible solution to the equation. This is called the best approximate solution. Find the best approximate solution for the equation

$$\begin{bmatrix} 1 & 2 \\ 2 & 4 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} = \begin{bmatrix} 1 \\ 1 \end{bmatrix}$$

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