PARUL UNIVERSITY
FACULTY OF ENGINEERING & TECHNOLOGY
Department of Applied Sciences & Humanities
Third Semester B. Tech (CSE, IT) (2025-26)
Discrete Mathematics (303191202)
Assignment 1

1. Write the relation represented by the following matrices and draw the corresponding digraph.

$$\begin{bmatrix} 0 & 1 & 0 & 0 \\ 1 & 0 & 1 & 0 \\ 1 & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 \end{bmatrix}$$

2. Let $A = \{1, 2, 5\}$ and $B = \{3, 5, 7\}$ and let $R = \{(a, b) | 7 \leq a + b < 10, a \in A, b \in B\}$.
   i) Write all the elements of R and R'
   ii) Write the inverse relation of R.
   iii) Find the Domain and Range of R and R^{-1}.

3. Each of following defines a relation on the positive integers:

   i) x.y is a square number.
   ii) x + y = 10.
   Determine which relations are reflexive, symmetric, antisymmetric and/or transitive.

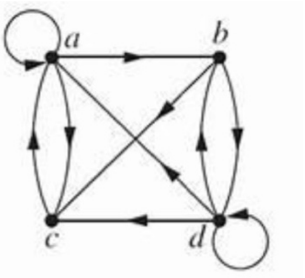
4. Check if $\mathbb{N}$ with the '$divides$' relation is a poset or not.

5. Let R and S be the relations on A = {a, b, c, d} defined by R = {(a,a), (a,c), (c,b), (c,d), (d,b)} and S = {(b,a), (c,c), (c,d), (d,a)}. Find the

   (i) composition relation of $R \circ S, S \circ R$.

   (ii) matrix representation of $R \circ S, S \circ R$.

6. Find reflexive closure, symmetric closure & transitive closure of the following diagraph:



7. Using Euclidean algorithm to find the GCD of (252, 105) and (1220, 516).

8. Prove using principle of mathematical induction: $1 + 2 + 2^2 + 2^3 + \cdots = 2^{n+1} - 1$.

9. How many different licenses plate can be made if each plate contains a sequence of three upper case English letters followed by three digits ?

10. Suppose that a department contains 10 men and 15 women. In how many ways can we form a committee of six members such that it contains equal number of men and women ?