SRM Institute of Science and Technology
18MAB302T– Discrete Mathematics for Engineers
ASSIGNMENT-1

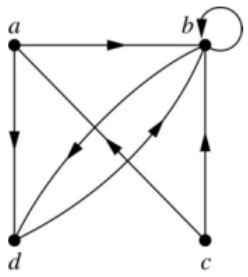
DUE DATE: 08.04.2022

Answer **ALL** Questions

1. Prove that $A-(B-C)=(A-B)\cup(A\cap C)$, using the laws of set algebra.
2. If R is the relation on the set $A=\{1,2,3,4,5\}$ defined by $(a,b)\in R$ if $a+b\leq 6$, then list the elements of R, R^{-1} and $\overline{R}$. Find the relational matrix M_R, $M_{R^{-1}}$ and $M_{\overline{R}}$.
3. If $f,g:\mathbb{R}\to\mathbb{R}$ where $f(x)=ax+b$, $g(x)=1-x+x^2$ and $(g\circ f)(x)=9x^2-9x+3$, find the value of a, b.
4. Let $R=\{(1,1),(1,2),(2,1),(2,2),(3,3),(3,4),(4,3),(4,4),(4,5),(5,4),(5,5)\}$ be a relation on the set $A=\{1,2,3,4,5\}$. Find the transitive closure using Warshalls algorithm.
5. If M_R is the matrix of a relation R defined on a set A of n elements, then the transitive closure of R is given by $M_{R^\infty}=M_R\vee M_{R^2}\vee\ldots\vee M_{R^n}$.

   Find the transitive closure of $R=\{(1,1),(1,3),(2,3),(3,4),(4,1),(4,2)\}$ defined on a set $A=\{1,2,3,4\}$, using above statement.
6. Give examples for functions $f:X\to Y$ and $g:Y\to Z$ such that

   (i) $g\circ f$ is onto, but f is not onto. (ii) $g\circ f$ is one-to-one, but g is not one-to-one.
7. Find the relation determined by the following digraph



8. Let $A=\{0,1,2,3,4\}$ and consider the following partition of A, $P=\{\{0,1,4\},\{2\},\{3\}\}$. Find the relation R induced by this partition.
9. Let $A=\{1,2,3,4,5,6\}$ and define a relation R on A as follows:

$$R=\{(1,1),(1,2),(1,4),(2,1),(2,2),(2,4),(3,3),(3,6),(4,1),(4,2),(4,4),(5,5),(6,6)\}.$$

   Draw the directed graph for R. Show that R is an equivalence relation. Find the distinct equivalence classes of R.
10. Let the relation R defined on a set $A=\{2,4,6,8,10,12,14,16,18,20\}$ is given by $(a,b)\in R$ if a divides b. Show that R is an partial order relation on A. Draw the Hasse diagram for the poset (A,R). Hence find the maximal, minimal, greatest and least elements of A.
11. Let $f:\{\mathbb{R}-1\}\to\{\mathbb{R}-1\}$ be a function such that $f(x)=\dfrac{x+1}{x-1}$. Show that f is bijective.