SRM Institute of Science and Technology

DEPARTMENT OF MATHEMATICS

ASSIGNMENT-1

Subject Code: 18MAB302T **Subject: Discrete Mathematics**

Chapter-I Sets, Relations and Functions

PART-B

1. Prove that $(A-B)\cap(C-B)=\phi$ analytically.
2. If R is the relation on the set $A=\{1,2,3\}$ such that $(a,b)\in R$ iff $a+b$ is even, find the relation matrix M_R, $M_{R^{-1}}$ and M_{R^2}.
3. If $f(x)=x+2$, $g(x)=x-2$ for $x\in R$ then prove that $f\circ g=g\circ f$.
4. If $f,g:R\to R$, where $f(x)=ax+b$, $g(x)=1-x+x^2$ and $(g\circ f)(x)=9x^2-9x+3$, find the values of a, b.
5. Verify whether the given relation R on the set $A=\{a,b,c,d\}$ is an equivalence relation or not justify your answer R=$\{(a,a),(a,c),(a,d),(b,b),(c,a),(c,c),(d,a),(d,d)\}$.
6. Find the matrix representation of $R\cup S$ and $R\cap S$ where R =$\{(1,1),(1,3),(2,2)\}$ and $S=\{(1,2),(1,3),(2,1),(2,2),(3,3)\}$ are the relations defined on the set A= $\{1,2,3\}$.

PART-C

1. State and prove Demorgan's Law of set theory.
2. If A, B and C are sets then prove the statement $(A\cap B)$-C=$(A-C)\cap(B-C)$ analytically.
3. If R is a relation on the set of positive integers such that $(a,b)\in R$ if and only if a^2+b is even, prove that R is an equivalence relation.
4. If R is a relation on the set of integers such that $(a,b)\in R$ if and only if $a^m=b$ for some positive integer m, show that R is partial ordering.
5. Let $R=\{(1,1),(1,3),(1,5),(2,3),(2,4),(3,3),(3,5),(4,2),(4,4),(5,4)\}$ be a relation on the set $A=\{1,2,3,4,5\}$. Find the transitive closure using Warshall's algorithm.
6. Show that the composition of invertible function is invertible.
7. Draw the Digraph and Hasse diagram for the divisibility relation on $\{2,4,5,10,12,20,25\}$.
8. If $f:Z\to N$ is defined by $f(x)$= $\begin{cases}2x-1 & if x>0\\ -2x & if x\le 0\end{cases}$. Prove that f is bijective.
9. If $f:R\to R$ defined by $f=\{(x,y)|ax+by=c, b\neq 0\}$ determine whether f is invertible if so find inverse.
10. Prove that R is an equivalence relation where aRb iff $3a+b$ is a multiple of 4.