Assignment-I

Q. 1 (a) If A = {a,b,c,d} and B = {x, y, z}. Let R be the following relation from A to B:
$R = \{(a,x),(a,z),(d,y),(c,x),(b,z),(d,x)\}$

(i) Determine the matrix of the relation.
(ii) Draw the arrow diagram of R.
(iii) Find the inverse relation R^{-1} of R.

(b) Prove that for any positive integer m, the relation congruence modulo m is an equivalence relation on the integers.

Q.2 (a) Let R is a relation on set of real numbers of and it is defined as $(a,b) \in R$ iff $x - y$ is an integer. Then show that R is an equivalence relation.

(b) Suppose $(a,b) \in R$ iff the price of book a is greater than or equal to the price of book b and the number of pages of book a greater than or equal to number of pages in b. Show that R is partially ordered relation.

Q.3 (a) Prove that $f(x) = x^3$ is a one-one function from $R \to R$ where R is set of real numbers. Also, prove that $f^{-1} \circ g^{-1} = (g \circ f)^{-1}$ for $f, g : Q \to Q$ such that $f(x) = 4x$ and $g(x) = x + 5$.

(b) Define one-one and onto functions and explain the composition of functions with diagram. Let f and g are two functions from $R \to R$ where R is set of real numbers. Find $(f \circ f)(x)$ if $f(x) = 3x^2$ and $(f \circ g)(x)$, $(g \circ f)(x)$ if $f(x) = x^2 - 2$ and $g(x) = x + 4$.

Q.4 Define POSET. Let R is a relation on set of integers ($\mathbb{Z}$) and defined as R ={(x ,y) | x/y} then prove that $\mathbb{Z}$ is POSET.

Q.5 (a) Draw the Hasse diagram for the poset ($P(S)$, $\subseteq$), where S={1,2,3,4}.

(b) Prove that the given Hasse diagram Lattice and also verify, it is distributive Lattice or not?