**TUTORIAL #5**

**RELATIONS, PARTIAL ORDERING**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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| **Q.1** | Find relation matrix MR and draw digraph of following relation set R: |
| **(i)** |  |
| **(ii)** |  |
| **Q.2** | . Find its transitive closure. |
| **Q.3** | Find the transitive closure of following R by Warshall’s algorithm: |
| **(i)** |  |
| **(ii)** |  |
| **(iii)** |  |
| **Q.4** | Show that the following R are an equivalence relation set: |
| **(i)** | Let I be the set of all integers and the relation R be defined over the set I by aRb iff a – b ia an even integers, where a , b ϵ I. |
| **(ii)** | Let I be the set of all integers and and . |
| **Q.5** | If R & S are equivalence relations on a set A, then R∩S is also an equivalence relation on set A. |
| **Q.6** | Let A be a non-empty set and R be an equivalence relation on set A. a ,b ϵ A.Then prove that  **(i)**aRb iff [a] = [b] , i.e. (a , b) ϵ R iff [a] = [b].  **(ii)** Either [a] = [b] or [a] ∩ [b] = Φ . |
| **Q.7** | Let I be the set of all integers and R = is an equivalence relation on the set I. By considering first five equivalence classes show that it is a partition of I. |
| **Q.8** | Let S = {1 ,2 ,3} and P(S) = { Φ, {1}, {2}, {3}, {1,2}, {1,3}, {2,3}, {1,2,3}}. R is a relation defined on set P(S). ARB iff A ⊆ B. Then show that R is a partial ordering on P(S). |
| **Q.9** | Show that the following relations are partial ordering and draw the Hasse diagram and compare with digraph.  **(i)** Let A = { 5, 6, 8, 10, 28, 36, 48} and R = {(a , b) / a is divisor of b}.  **(ii)** Let A = { 1, 2, 3, 4, 5, 6, 7, 8, 9, 12, 18, 24} be ordered by the relation x divides y. |
| **Q.10** | Let A = {1, 2, 3, 5, 6, 10, 15, 30}. [Factors of 30] aRb iff a|b (a divides b) then (A , R) is POSET. Draw the Hasse diagram. Find Chains and Antichains corresponding to the POSET. |
| **Q.11** | Let S = {2, 3, 4, 6, 8, 12, 24, 36} Draw the Hasse diagram and find upper bounds and lower bounds of corresponding elements. |
| **Q.12** | Let A be set of factor of positive integer m and relation is divisibility on A.  i.e. R = { (x , y) / x , y ϵ A, x divides y}. For m = 45 show that Poset (A, ≤) is lattice. Draw Hasse diagram and give join and meet for the lattice. |