Course: Mathematics-III **Semester- 3**

SHREYARTH UNIVERSITY

School of Computer Science and Applications

BCA, BCA (H), IM.Sc – CA & IT

Assignment-1

Module -2: Relations

Submission Date: For Division-A & B (09/09/2024)
For Division- C & I.M.Sc. (09/09/2024)

1 If $A=\{2,4\}$, $B=\{2,4,6\}$ then find $A\times B, A\times A, B\times B$ and $A\times(B\times B)$

2 If $A=\{1,4\}$, $B=\{2,3\}$ then find $A\times B, A\times A$ and $B\times B$

3 If $A=\{1,2\}$, $B=\{3,4\}$ then find $A\times B, A\times A$ and $B\times B$

4 Define the following terms with an example for each.
(1) Relation (2) Domain of Relation (3) range of Relation

5 Discuss types of Relations with an example for each.

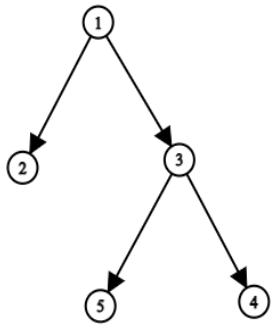
6 Check whether the following relations are transitive or not. Also Find domain and Range of a relation.

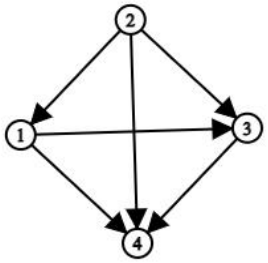
$R_1=\{(1,1)\}$, $R_2=\{(1,2),(2,2)\}$, $R_3=\{(1,2),(1,3),(2,1),(2,3)\}$

7 Let $X=\{1,2,3,4\}$ and $R=\{(x,y)/\,x>y\}$.Draw the graph of R and give its matrix.

8 Let $X=\{1,2,3,4\}$and $R=\{(1,1),(1,4),(4,1),(4,4),(2,2),(2,3),(3,2),(3,3)\}$.Write matrix of R and sketch its graph.

9 Determine the properties of the relations given by the graphs as given below. Also, write corresponding relation matrices.





10 Let $X=\{1,2,3,4,5,6,7\}$ and $R=\{(x,y)/\,x-y\ is\ even\}$. Show that R is an equivalence relation.

11 Let Z be the set of integers and R be the relation called "congruence modulo 3" defined by $R = \{(x, y) / x - y \text{ is divisible by } 3\}$.Determine equivalence classes generated by the elements of Z.

12 Le t $R = \{(1,2),(3,4),(2,2)\}$ and $S = \{(4,2),(2,5),(3,1),(1,3)\}$. Find $R \circ S$, $S \circ R$, $R \circ (S \circ R), (R \circ S) \circ R, R \circ R, S \circ S$, and $R \circ R \circ R$.

13 Let $A = \{2,3,6,12,24,36\}$ and the relation $\leq$ be such that $x \leq y$ if x divides y . Draw the Hasse diagram of $(A, \leq)$.

14 Let $\subseteq$ be a relation on a set $P(A)$, i.e. power set of A. Then, draw Hasse diagram for $(1) A = \{a\}$ $(2) A = \{a, b\}$ and $(3) A = \{a, b, c\}$.

15 Draw the Hasse diagram of the following sets under the partial order relation "divides" and indicate those which are totally ordered sets.
$(a)\{2,6,24\}, (b)\{3,5,15\}, (c)\{1,2,3,6,12\}$ and $(d)\{3,9,27,54\}$

16 Let $P = \{2,3,6,12,24,36\}$ and the relation $\leq$ be such that $x \leq y$ if x divides y . Then, find least and greatest member in P if exists. Also, find minimal and maximal elements. Find upper bounds, lower bounds, LUB and GLB if exists for sets
$(a)\{2,3,6\}, (b)\{2,3\}, (c)\{6,12\}, (d)\{24,36\}$ and $(e)\{3,12,24\}$.

17 Define With example: Lattice, Complete Lattice, Bounded lattice, Complement element, and Complemented lattice.

18 Let $A = \{a, b, c\}$.Then show that the poset $(P(A), \subseteq)$ is a lattice.

19 Let $A = \{1, 2, 3\}$. Check whether the poset $(P(A), \subseteq)$ is a lattice.

20 Let $A = \{2,3,4,6,8,12,24,36\}$.Check whether the poset $(A, /)$ is a lattice.

21 Draw Hasse diagram for lattice $(D_6, /)$. Check whether it is bounded or not.

22 Define lattice. Determine whether poset $(\{1,2,3,4,5\}, /)$ is a lattice or not.

23 Draw Hasse diagram for lattice $(D_{24}, /)$. Check whether it is a complete lattice or not.

24 Draw Hasse diagram for lattice $(D_{30}, /)$. Check whether it is a complemented lattice or not.

25 Show that $(D_{45}, /)$ is a lattice.