Practice Questions

Relation

1. If A={1,4,5} and the relation R defined on the set A as aRb if a+b < 6 check whether the relation R is an equivalence relation
2. Define Partial Order relation and check whether R is Partial Order relation. R= {(x,y) $if\ y = x^r, r\ is\ positive\ integer\ and\ a, b\ \in Z\}$.
3. Show that the relation $R = \{(a, b)$ such that $a - b\ is\ divisible\ by\ 5\ , a, b \in\ Z\}$ is an equivalence relation hence find all equivalence classes
4. Show that the relation $R = \{(a, b)$ such that $a - b\ is\ divisible\ by\ 4\ , a, b \in\ Z\}$ is an equivalence relation hence find all equivalence classes
5. Show that the relation $R = \{(a, b)$ such that $a - b\ is\ divisible\ by\ 7\ , a, b \in\ Z\}$ is an equivalence relation hence find all equivalence classes
6. Show that the relation $R = \{(a, b)$ such that $2a + 3b\ is\ divisible\ by\ 5\ , a, b \in\ Z\}$ is an equivalence relation
7. Show that the relation $R = \{(a, b)$ such that $3a + 4b\ is\ divisible\ by\ 7\ , a, b \in\ Z\}$ is an equivalence relation
8. If A={a,b,c,} and find relation R such that (i) R is reflexive , but not symmetric , not transitive (ii) R is reflexive , symmetric , but not transitive.
9. If A={a,b,c,} and find relation R such that (i) R is not reflexive , not symmetric , but transitive (ii) R is reflexive , transitive , but not symmetric
10. Draw the digraph and find matrix of relation for R$\cup S$ and R$\cap S$ if relations R & S are defined on a set $A = \{1,2,3,4,5,6\}$ as
    $R = \{(a, b)$ such that $a\ divides\ b,\ \forall\ a, b \in\ \}$
    $S = \{(a, b)$ such that $a\ is\ multiple\ of\ \ , \forall\ a, b \in A\ \}$
11. Draw the digraph for $\bar{R} \cup \bar{S}$ and $R^{-1} \cap S^{-1}$ where R & S are defined on a set A
    If $A = \{1,2,3,4\}$ as $R = \{(a, b)$ such that $a < b,\ \forall\ x, y \in A\ \}$
    S= $\{(a, b)$ such that $a < b + 1, \forall\ a, b \in\ \}$
12. Show that the relation $R = \{(a, b)$ such that $3a + 2b\ is\ divisible\ by\ 5\ , a, b \in\ Z\}$ is an equivalence relation
13. Show that the relation $R = \{(a, b)$ such that $4a + 3b\ is\ divisible\ by\ 7\ , a, b \in\ Z\}$ is an equivalence relation
14. Draw the digraph of R , find matrix of R hence check whether R is reflexive , symmetric , transitive where A = {a,b,c,d} and a relation R is defined on A as R={(a,a), (b,b), (c,c), (a,b), (b,a), (a,c), (c,b), (b,c), (d,d), (c,d), (d,c)}
15. A relation R is defined on set of integers Z as aRb if 8 divides $a - b$ Prove that R is an equivalence relation
16. If A={2,3,4,5,6} and the relation R defined on the set A as aRb if a+b < 7. (i) Draw the digraph of R (ii) find matrix of R (iii) Check whether R is reflexive , symmetric , transitive ?
17. If A={1,4,7} then write all possible partitions and corresponding equivalence relations
18. If A={a,b,c,d} then write all possible partitions and corresponding equivalence relations.
19. if relations If A={a,b,c,d} and find relation R such that (i) R is reflexive , but not symmetric , not transitive (ii) R is reflexive , symmetric , but not transitive
20. Determine whether the relation R on a set A is reflexive, symmetric, antisymmetric or transitive. A = set of all positive integers, a R b iff $|a{-}b|\leq 2$
21. Determine whether the relation R on a set A={}1,2,3,5} is reflexive, symmetric, antisymmetric or transitive. A = set of all positive integers, a R b iff $|a{-}b|\leq 4$
22. let A = {1, 2, …., 8}. Let R be the equivalence relation defined by x ≡ ymod(4) Write R as a set of ordered pairs Find the partition of A induced by R .

23. A = {1, 2, 3, 4} and R = {(1, 1), (1, 2), (2, 1), (2, 2), (3,4), (4, 3), (3, 3), (4, 4)}.
Shows that R is an equivalence relation on A hence find partition of A induced by R.

24. let A = {1, 2, 3,4}. Let R & S be an equivalence relations on A given as
R = {(1, 1), (1, 2), (2, 1), (2, 2), (3,4), (4, 3), (3, 3), (4, 4)}
S= {(1, 1), (2, 2), (3,1), (1, 3), (3, 3), (4, 4)}

find partition of A induced by $R^{-1} \cap S^{-1}$, R^{-1} , $R \cap S$

25. Let A = {1, 2, 3, 4}, B = {a, b, c, d},C = {x, y, z } and
let R = {(1, a), (2, d), (3, a), (3, b), (3, d)} be a relation from A to B and
S = {(b, x), (b, z), (c, y), (d, z)} be a relation from B to C. Write SOR Find Domain, Range, matrix of SOR

26. Let $A = \{1, 2, 3, 5, 6, 10, 15, 30\}$ and R be the relation 'is divisible by' i.e. $aRb \text{ if } a \text{ divides } b$. Obtain the relation matrix and draw the Hasse diagram.

27. Let $A = \{1, 2, 3, 4, 6, 9, 12, 18, 36\}$ and R be the relation 'is divisible by' i.e. $aRb \text{ if } a \text{ divides } b$. Obtain the relation matrix and draw the Hasse diagram.

28. Draw Hasse diagram of the following relations.

(i) $R_1 = \left\{ \begin{matrix} (1,1), (1,2), (1,3), (1,4), (1,5), (2,2), (2,3), (2,4), (2,5), \\ (3,3), (3,4), (3,5), (4,4), (4,5), (5,5) \end{matrix} \right\}$

(ii) $R_2 = \left\{ \begin{matrix} (1,1), (1,3), (1,4), (1,5), (2,2), (2,3), (2,4), (2,5), \\ (3,3), (3,4), (3,5), (4,4), (4,5) \end{matrix} \right\}$

29. Determine the Hasse diagram of the relation on $A = \{a, b, c, d, e\}$ whose matrix is shown below.

$$\begin{bmatrix} 1 & 1 & 1 & 1 & 1 \\ 0 & 1 & 1 & 1 & 1 \\ 0 & 0 & 1 & 1 & 1 \\ 0 & 0 & 0 & 1 & 1 \\ 0 & 0 & 0 & 0 & 1 \end{bmatrix}$$

30. Determine the Hasse diagram of the relation on $A = \{a, b, c, d, e\}$ whose matrix is shown below.

$$\begin{bmatrix} 1 & 0 & 0 & 0 & 0 \\ 1 & 1 & 0 & 0 & 0 \\ 1 & 1 & 1 & 0 & 0 \\ 1 & 1 & 0 & 1 & 1 \\ 1 & 0 & 0 & 0 & 1 \end{bmatrix}$$

31. Let $A = \{a, b, c, d, e\}$ and
$R =$
$\{(a, a), (b, b), (c, c), (d, d), (e, e), (a, c), (a, e), (b, c), (b, d), (b, e), (c, e), (d, e)\}$

Prove that (A, R) is a Poset . Draw its Diagraph and Hasse Diagram.