Lecture 10:-

Anti Symmetric:- $\forall a,b \in A$ if $(a,b) \in R \wedge (b,a) \in R \rightarrow a=b$.

Ex 12:- $R = \{(a,b) \mid a \text{ divides } b\}$. $A = \mathbb{Z}^+$.
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Symmetric: $\forall a,b \in A$ if $(a,b) \in R \rightarrow (b,a) \in R$.

$\forall a,b \in \mathbb{Z}^+$ if a divides $b \rightarrow b$ divides a.

$(3,6) \in R \rightarrow (6,3) \notin R$.

$\therefore$ Not Symmetric.

Anti Symmetric.

$\forall a,b \in A$ if $(a,b) \in R \wedge (b,a) \in R \rightarrow a=b$.

$(a \geq b \wedge b \geq a) \rightarrow a=b$.

$\forall a,b \in \mathbb{Z}^+$ if a divides $b \wedge b$ divides $a \rightarrow a=b$.

It is Anti Symmetric.

$R = \{(a,b) \mid a=b\}$ Symmetric. Reflexive.

$a > b$. Anti Symmetric

$a \geq b$. $A = \mathbb{Z}$.

Ans. $a < b$

$a \leq b$

Transitive: $\forall a,b,c \in A$ if $(a,b) \in R \wedge (b,c) \in R \rightarrow (a,c) \in R$.

Ex7:- $A = \{1,2,3,4\}$

$R = \{(1,1), (1,2), (2,1), (2,2), (3,4), (4,1), (4,4)\}$. X

$(3,1) \notin R$.

$R = \{\}$.

$R = \{(1,2)\}$.

$A = \{1,2\}$ $\quad$ $A \times A = \{(1,1),(1,2),(2,1),(2,2)\}$.

HW.

Total $\quad$ Reflexive.
Symmetric.
Anti Symmetric.
Transitive

?

$\bar{R} = \{(a,b) \mid (a,b) \notin R\} = A \times A - R$ ✓.

$\cup, \cap, -,$ Complement.

Ex 17
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$A = \{1,2,3\}$. $\quad$ $B = \{1,2,3,4\}$.

$|Pos(A \times B)| = 2^{|A \times B|} = 2^{12}$

$R_1 = \{(1,1),(2,2),(3,3)\}$. $\quad$ $R_2 = \{(1,1),(1,2),(1,3),(1,4)\}$.

$R_1 \cup R_2 = \{(1,1),(2,2),(3,3),(1,2),(1,3),(1,4)\}$.

$R_1 \cap R_2 =$ - - - -

$R_1 - R_2 = \{(2,2),(3,3)\}$.

$R_2 - R_1 = \{(1,2),(1,3),(1,4)\}$.

Ex 19: $\quad$ $R_1 = \{(a,b) \mid a > b\}$ $\quad$ $R_2 = \{(a,b) \mid a < b\}$.

$R_1 \cup R_2 = \{(a,b) \mid a > b \vee a < b\}$. $\quad$ $A = \mathbb{R}$.

$= \{(a,b) \mid a \neq b\}$.

$R_1 \cap R_2 = \{(a,b) \mid a > b \wedge a < b\}$.

$= \Phi$

$\neg(>) = \leq$

$\neg(<) = \geq$.

$R_1 - R_2 = \{(a,b) \mid a > b \wedge \neg(a < b)\}$.

$= \{(a,b) \mid a > b \wedge a \geq b\}.$

$= \{(a,b) \mid a \geq b\}.$

$R_2 - R_1 = ?$

How to expand formula.

$R = \{(a,b) \mid a \text{ divides } b\}.$

$\forall x P(x).$

$\forall a,b$

$A = \{1, 2, 3\}.$

$\forall a,b \in A$ if $(a,b) \in R \rightarrow (b,a) \in R.$

1 divides 1 → 1 divides 1 ∧ 1 divides 2 → 2 divides 1.
1 divides 3 → 3 " 1 ∧

2 divides 1 → 1 divides 2 ∧ 2 divides 2 → 2 divides 2.
2 " 3 → 3 " 2 ∧.

Complete