Lecture 11:-

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

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

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

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

$\therefore$ Not Symmetric.

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

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

which holds

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

$a>b$. Anti Symmetric

$a \geq b$. $A = Z$.

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

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

a b b c.

$\downarrow \downarrow \quad \downarrow \downarrow$
$a \; b \quad b \; c.$

$(3,1) \notin R.$

$R = \{\}.$

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

$A = \{1,2\}$

HW.

Total: Reflexive. Symmetric. Anti Symmetric. Transitive ?

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

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

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

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

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

$R_1 \cup R_2 = \{(1,1),(2,2),(3,3),(1,2),(1,3),(1,4)\}.$
$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: $R_1 = \{(a,b) \mid a > b\}$ $R_2 = \{(a,b) \mid a < b\}.$

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

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

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

$= \phi$

$\neg(>) = \leq$

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

$= \emptyset$

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

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

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

$\neg(>) = \leq$

$\neg(<) = \geq.$

$R_2 - R_1 = ?$