Lecture 12:- Properties of Relations.

1- Reflexive.

2- Symmetric

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

3. Anti Symmetric

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

Revision.

Binary Relation.

$|A \times B| = |A| \times |B|$.

$R \subseteq A \times B$.

$2^{|A \times B|} = 2^{|A| \times |B|}$.

if a Relation R is defined on A. $A \times A$.

$|A| = 6$.

$2^{|A| \times |A|} = 2^{6 \times 6} = 2^{36}$

Ex7: 462

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

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

a b a b

$R_2 = \{\ \}$.

$R_3 = \{(3,4)\}$.

Ex12: 463 Is the divides relation on set of positive Integers.

1) Symmetric 2) Antisymmetric.

$R = \{(a,b) \mid a \text{ divides } b\}$ $A = Z^+$.

a divides b = $b \div a = \frac{b}{a}$

a divided by b = $a \div b = \frac{a}{b}$

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.

AntiSymmetric:- $\forall a,b \in A$ 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.

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

4- . Transitive - $\forall a,b,c \in A$ if $(a,b) \in R \land (b,c) \in R \rightarrow (a,c) \in R$.

Ex7
462. $A = \{1,2,3,4\}$.

$R_1 = \{(\overset{\times}{1},1), (\overset{\times}{1},2), (\overset{\times}{2},1), (\overset{\times}{2},2), (3,4), (4,1), (4,4)\}$. ✗ .

$R_2 = \{\}$.

Ex12 :- Is the divides relation on Set of positive Integers.
463 Transitive.

$R = \{(a,b) \mid a \text{ divides } b\}$ $A = \mathbb{Z}^+$.

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

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

Ex/ P467 .

$R = \{(x,y) \mid xy = 0\}$ $A = \mathbb{Z}$.

$R = \{(x,y) \mid x+y = 0\}$ $A = \mathbb{Z}$.

$R = \{(x,y) \mid x = 2y\}$ $A = \mathbb{Z}$.