**TOPIC:1-Relation & Partial order Relation**

## Relation :

Relationship between elements of sets are represented using the structure called a relation.

Eg : Let $A = \{1, 2, 3\}$, $B = \{a, b\}$

Then $A \times B = R = \{(1,a)\ (2,a)\ (3,a)\ (1,b)\ (2,b)\ (3,b)\}$

R is a relation from A to B.

## Properties of relation :

### Reflexive Relation :

A relation R on a set A is said to be reflexive if $xRx$ (or) $(x,x) \in R$, $\forall x \in A$.

Eg : Let A be the set of all straight lines in a plane. The Relation R "x is parallel to x" is a reflexive relation, since every straight line is parallel to itself.

## Symmetric Relation :

A relation R defined on a set A is said to be Symmetric if $xRy \Rightarrow yRx$.

(ie) if $(x,y) \in R \Rightarrow (y,x) \in R$

Eg: Let A be set of straight lines in a plane. Then the relation R "perpendicular to" is Symmetric since $x \perp y \Rightarrow y \perp x$. $x, y \in A$.

## Transitive Relation :

A relation R is said to be transitive.

If $xRy$ & $yRz \Rightarrow xRz$, for all $x,y,z \in A$

(ie) If $(x,y) \in R$ & $(y,z) \in R \Rightarrow (x,z) \in R$.

Eg :

Let A be set of straight lines in a plane. Then the relation R "x is parallel to y" is a transitive, Since x parallel to y & y parallel to z $\Rightarrow$ x is parallel to z.

## Irreflexive :-

A relation R on a set A is said to be Irreflexive if $(x,x) \notin R \quad \forall x \in A$.

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## Antisymmetric:-

A relation R on a set A is said to be Antisymmetric if $xRy$ & $yRx$ then $x=y$.

(ie) R is antisymmetric if $(x,y) \in R$ then $(y,x) \notin R$ $\forall x,y \in A$.

## Partial order relation:-

A relation R on a set A is said to be a partial order relation if R is reflexive, antisymmetric and transitive.