L-9 Sets Relation

Wednesday, February 9, 2022 10:03 AM

CA-1 15/2/22 Tuesday In Class time

Unit-1 30-Question 25% Negative Marking

Ordered Sets, Lattices, Boolean algebra : partially ordered sets, external elements of POSET, HASSE diagrams of POSETS, well-ordered sets, lattices, bounded lattices, distributive lattices, introduction to boolean algebra, basic definitions, duality, basic theorems, boolean algebras as lattices

Set:→ Welldefined Collection of distinct objects. Collection of Rivers — Not Welldefined

Representation ① Roster form: $\{1, 2, 3, 4, 5, 6\}$

② Set Builder: $\{x : x \in N, x \leq 6\}$

A =
B =
C =

$\phi = \{\}$ $n(\phi) = 0$

No. of elements in the set $n(A)$

SubSet Sub — "A part"

$\subseteq$ Subset — A part of a set

$A = \{ \{B\} \}$

B is a subset of A

$B \subseteq A$

$B \subset A$ B is proper subset of A

A is superset of B

$\leq$ $<$ $\geq$ $>$

Powerset → Set of all subset of a set

$P(A)$ $n(P(A)) = 2^n$ $n = n(A)$ = No. of element in set A

ϕ is subset of every set

Equal: $A \subseteq B$ and $B \subseteq A \Rightarrow \boxed{A = B}$

$x \leq y$, $y \leq x$, $\therefore x = y$

Algebra of Sets Set operations

① Union OR $A \cup B$ Addition

② Intersection And $A \cap B$ Common part

③ Complement Not $\overline{A} = X - A$

$X = \{1, 2, \ldots, 10\}$

$A = \{1, 2, 3, 7\}$

$\overline{A} = X - A$

$= \{4, 5, 6, 8, 9, 10\}$

④ $A - B$ → from A remove the element of B if there are

from A Remove the Common element of A & B

⑤ $A \Delta B$

⑥ Disjoint → No Common element

$\boxed{A \cap B = \phi}$

+

−

$A \cap B = \phi$

$= \{4, 5, 6, 8, 9, 10\}$

+ − × ÷

⑤ Symmetric Diff $A \Delta B = (A - B) \cup (B - A)$

①	Idempotent Law:	$A \cup A = A$, $A \cap A = A$
②	Associative Law	$(A \cup B) \cup C = A \cup (B \cup C)$ $(A \cap B) \cap C = A \cap (B \cap C)$
③	Commutative Law	$A \cap B = B \cap A$ $A \cup B = B \cup A$
④	Distributive Law:	$A \cup (B \cap C) = (A \cup B) \cap (A \cup C)$ $A \cap (B \cup C) = (A \cap B) \cup (A \cap C)$
⑤	Identity Law:	$A \cup \phi = A$ $A \cap \phi = \phi$ $A \cup U = U$ $A \cap U = A$
⑥	Involution Law	$(A')' = A$
⑦	Complement Law:	$A \cup A' = U$ $A \cap A' = \phi$ $U' = \phi$ $\phi' = U$
⑧	De Morgan's Law:	$(A \cup B)' = A' \cap B'$ $(A \cap B)' = A' \cup B'$

Cartesian Product of Sets

A, B

$A \times B = \{(a, b);\ a \in A, b \in B\}$

$B \times A = \{(x, y);\ x \in B, y \in A\}$

$B \times A = \{(b, a);\ b \in B, a \in A\}$

$A \times B \neq B \times A$

① $A = \{1, 2\}$ $B = \{1, 2, 3\}$

$A \times B = \{(1,1)\ (1,2)\ (1,3)\ (2,1)\ (2,2)\ (2,3)\}$

② $A = \{a, b\}$ $B = \{1, 2\}$

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

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

$A \times B \neq B \times A$

Note: $n(A \times B) = n(A) \cdot n(B)$

① $n(A) = 2$

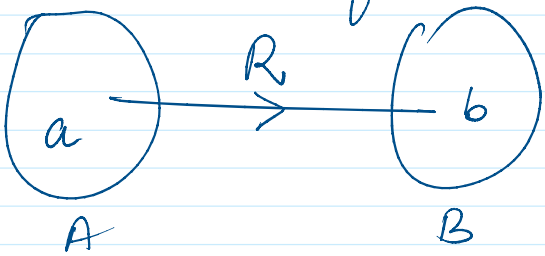
$n(B) = 3$

$n(A \times B) = 6 = 2 \cdot 3$

Relation :→ Connection / Some properties / Similarities / Association

$A = \{ — a — \}$ $B = \{ — b — \}$

'R' is a Relation from set A to set B



$R \subseteq A \times B$

$R = \{(a, b);\ a \in A, b \in B\}$

$(a, b) \in R$

A B

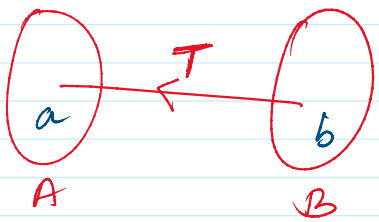
$R = \{(a,b);\ a \in A, b \in B\}$

$(a,b) \in R$

aRb

'a' is Related to 'b'

$a \in A$ $\quad$ $b \in B$



T is a Relation from B to A

$T \subseteq B \times A = \{(b,a);\ b \in B, a \in A\}$