CHAPTER – 1

SETS

FORMULAE :

(1) For a set A, $A \subset A$.

(2) For any set A, $\varnothing \subset A$.

(3) Results of Union operation :

(a) $A \in P(U)$, $B \in P(U)$ then $A\ (A \cup B) \in P(U)$

(b) $A \subset (A \cup B)$, $B \subset (A \cup B)$

(c) $A \cup A = A$

(d) $A \subset B$, $C \subset D$ then $(A \cup C) \subset (B \cup D)$

(e) If $x \notin A \cup B$, then $x \notin A$ and $x \notin B$

(f) $A \cup B = B \cup A$ (Commutative law)

(g) $A \cup (B \cup C) = (A \cup B) \cup C$ (Associative law)

(h) $A \cup \varnothing = A$ ($\varnothing$ is an identity element)

(i) $A \cup U = U$

(4) Results of Intersection operation :

(a) $A \in P(U)$, $B \in P(U)$, then $A \cap B \in P(U)$

(b) $A \cap B \subset A$, $A \cap B \subset B$

(c) $A \cap A = A$

(d) $A \subset B$, $C \subset D$, then $(A \cap C) \subset (B \cap D)$

(e) If $x \notin A \cap B$, then $x \notin A$ or $x \notin B$

(f) $A \cap B = B \cap A$ (Commutative law)

(g) $A \cap (B \cap C) = (A \cap B) \cap C$ (Associative law)

(h) $A \cap U = A$ (U is an identity element.)

(i) $A \cap \varnothing = \varnothing$

(5) Distributive law :

(a) $A \cap (B \cup C) = (A \cap B) \cup (A \cap C)$

(Distribution of intersection operation on union operation)

(b) $A \cup (B \cap C) = (A \cup B) \cap (A \cup C)$

(Distribution of union operation on intersection operation)

(6) Properties for complement set :

(a) $A' \in P(U)$ (b) $a \in A' \Leftrightarrow a \notin A$ (c) $A \cup A' = U$

(d) $A \cap A' = \varnothing$ (e) $U' = \varnothing$ (f) $\varnothing' = U$

(7) De–Morgan's laws :

(a) $(A \cup B)' = A' \cap B'$

(b) $(A \cap B)' = A' \cup B'$

(8) Some properties of difference operation :

(a) $A = B$, then $A - B = \varnothing$

(b) $A - B = A \cap B' = A - A \cap B$

(c) $A - \varnothing = A$ and $\varnothing - A = \varnothing$

(d) $A - B \subset A$, $B - A \subset B$

(e) $A \subset B \Rightarrow A - B = \varnothing$

(f) $U - A = A'$ and $A - U = \varnothing$

(h) For $A \neq B$, $A - B \neq B - A$

(9) If A and B are disjoint sets, then we have

$n(A \cup B) = n(A) + n(B)$

Similarly, $n(A \cup B \cup C) = n(A) + n(B) + n(C)$;

Where, $A \cap B = B \cap C = C \cap A = \varnothing$

(10) $n(A \cup B) = n(A) + n(B) - n(A \cap B)$

(11) $n(A \cup B \cup C) = n(A) + n(B) + n(C) - n(A \cap B) - n(B \cap C) - n(C \cap A) + n(A \cap B \cap C)$

(12) The number of elements which are in only one of the three sets :

$n (A \cup B \cup C) - n (A \cap B) - n (B \cap C) - n (C \cap A) + 2n (A \cap B \cap C)$

(13) The number of elements which are exactly in two of the three sets :

$n (A \cap B) + n (B \cap C) + n (C \cap A) - 3n (A \cap B \cap C)$

(14) $n (A - B) = n (A \cap B') = n (A - A \cap B) = n (A) - n (A \cap B)$

(15) $n(A) = n(A - B) + n(A \cap B)$

(16) $n(B) = n(B - A) + n (A \cap B)$

(17) $n(A \cup B) = n(A - B) + n(B - A) + n(A \cap B)$

(18) $n(A - B) = n(A) - n(A \cap B)$

(19) $n(A - B) \cup (B - A)) = n(A - B) + n(B - A) = n(A) + n(B) -2n (A \cap B)$

(20) $n(A' \cap B') = n(A \cap B)') =n(S) - n(A \cap B)$

(21) $n(A' \cap B') = n((A \cup B)') = n(S) - n(A \cup B)$

(22) $n(A \cap B) = n(A \cup B) - n(A \cap B)' - n(A' \cap B)$