

1 SETS & RELATIONS

1 VSAQ [2M]

SINGLE PAGE SYNOPSIS

SETS

- Set:** A set is a 'well defined' collection of distinct **elements** / objects / ideas.
- Roster form:** In this form, all the elements of the set are listed between braces $\{ \}$.
- Set builder form:** Here all the elements of the set are expressed by a **common property**.
- Empty Set (ϕ) or Null set:** It is a set containing no element.
- Finite Set:** A set with **definite (countable)** number of elements.
- Infinite Set:** A set with **infinite (uncountable)** number of elements.
- Equal Sets:** Sets with **exactly the same elements** are equal sets.
- Subset ($A \subseteq B$):** If every element of set A is also an element of B, then A is said to be a subset of B.
 - $A \subseteq B$ iff $a \in A \Rightarrow a \in B$
 - Every set is subset to itself.
 - ϕ is subset to every set.
- Cardinality of a set A is $|A|$ or $n(A)$:** It is the **number of elements** in the set A.
- Power set $P(A)$:** It is the set of **all subsets** of A.
 - If $|A| = n$ then the number of elements in its power set is $|P(A)| = 2^n$.
- Union of Sets ($A \cup B$)** is the set containing **all the elements** in A, B.
 - $A \cup B = \{x / x \in A \text{ or } x \in B\}$
- Intersection of Sets ($A \cap B$)** is the set containing **common elements** of both A and B.
 - $A \cap B = \{x / x \in A \text{ and } x \in B\}$
 - If $A \cap B = \phi$ then A, B are called disjoint sets..
- Difference of Sets ($A - B$)** is the set of elements in first set A but not in second set B.
 - $A - B = \{x / x \in A \text{ and } x \notin B\}$;
 - $A - B = A - (A \cap B)$ (**only A** but not B)
- Symmetric difference of Sets** is $A \Delta B = (A - B) \cup (B - A)$
- Complement of a set (A')** is the set with all elements **not in A**, but in universal set. $A' = \mu - A$.
- Cartesian product of sets** is $A \times B = \{(a, b) / a \in A, b \in B\}$
 - If $n(A) = p$ and $n(B) = q$ then $n(A \times B) = pq$

RELATIONS

- Relation ($R : A \rightarrow B$):** Any subset of $A \times B$. Here A, B are non-empty sets.
- If $R : A \rightarrow B$ is a relation then **A** is called **domain**, **B** is called **codomain**, **Range** is $f(A)$.
- A relation R on A is **Reflexive** if $(a, a) \in R \forall a \in A$
- A relation R on A is **Symmetric** if $(a, b) \in R \Rightarrow (b, a) \in R$
- A relation R on A is **Transitive** if $(a, b) \in R$ and $(b, c) \in R \Rightarrow (a, c) \in R$
- A relation R on A is **Equivalence** if R is reflexive, symmetric and transitive.