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Note:-

1. All Questions are compulsory.
2. Numbers on the right indicate full marks.

Section A

Q.1. Select and write the correct answer.

(4)

1. For any set A, (A') is equal to
A) A' B) A
C) ϕ D) None of these
2. Let A and B be the two sets in the same universal set. Then, $A - B =$
A) $A \cap B$ B) $A' \cap B$
C) $A \cap B'$ D) None of these

Q.2. Answer the following.

(3)

1. Find $R : A \rightarrow A$ when $A = \{1, 2, 3, 4\}$ such that, $R = \{(a, b) / |a - b| = 10\}$
2. If $P = \{1, 2, 3\}$ and $Q = \{4\}$, find sets $P \times Q$ and $Q \times P$
3. Write down the following set in set builder form : $\{10, 20, 30, 40, 50\}$

Section B

Attempt any Four

- Q.3 Describe the following set in Set-Builder form $\{0, -1, 2, -3, 4, -5, 6 \dots\}$ **(2)**
- Q.4 Write the relation in the Roster form. State its domain and range $R_6 = \{(a, b) / a \in \mathbb{N}, a < 6 \text{ and } b = 4\}$ **(2)**
- Q.5 Write the relation in the Roster form. State its domain and range. **(2)**
 $R_2 = \left\{ \left(a, \frac{1}{a} \right) / 0 < a \leq 5, a \in \mathbb{N} \right\}$
- Q.6 (i) If $A = \{1, 2, 3\}$ and $B = \{2, 4\}$, state the elements of $A \times A, A \times B, B \times A, B \times B, (A \times B) \cap (B \times A)$ **(2)**
(ii) If $A = \{-1, 1\}$, find $A \times A \times A$
- Q.7 Write the relation in the Roster form. State its domain and range $R_3 = \{(x, y) / y = 3x, y \in \{3, 6, 9, 12\}, x \in \{1, 2, 3\}\}$ **(2)**
- Q.8 Solve the following inequalities and write the solution set using interval notation $\frac{2x}{x - 4} \leq 5$ **(2)**

Section C

Attempt any Two

- Q.9 Check if $R : \mathbb{Z} \times \mathbb{Z}, R = \{(a, b) / 2 \text{ divides } a-b\}$ is equivalence relation. **(3)**
- Q.10 In a school there are 20 teachers who teach mathematics or physics, of these, 12 teach mathematics and 4 teach both physics and mathematics. How many teachers teach physics? **(3)**

Q.11 Identify which of the following relations are reflexive, symmetric, and transitive. (3)

Relation	Reflexive	Symmetric	Transitive
$R = \{(a, b) : a, b \in \mathbb{Z}, a - b \text{ is an integer}\}$			
$R = \{(a, b) : a, b \in \mathbb{N}, a + b \text{ is an even}\}$			
$R = \{(a, b) : a, b \in \mathbb{N}, a \text{ divides } b\}$			
$R = \{(a, b) : a, b \in \mathbb{N}, a^2 - 4ab + 3b^2 = 0\}$			
$R = \{(a, b) : a \text{ is sister of } b \text{ and } a, b \in G = \text{Set of girls}\}$			
$R = \{(a, b) : \text{Line } a \text{ is perpendicular to line } b \text{ in a place}\}$			
$R = \{(a, b) : a, b \in \mathbb{R}, a < b\}$			
$R = \{(a, b) : a, b \in \mathbb{R}, a < b^3\}$			

Section D
Attempt any One

Q.12 If $A = \{x/6x^2 + x - 15 = 0\}$, $B = \{x/2x^2 - 5x - 3 = 0\}$, $C = \{x/2x^2 - x - 3 = 0\}$ then find (4)
(i) $(A \dot{\cup} B \dot{\cup} C)$ (ii) $(A \dot{\cap} B \dot{\cap} C)$.

Q.13 Solve the following inequalities and write the solution set using interval notation $6x^2 + 1 \leq 5x$ (4)