(v) $R_5 = \{(a, b), (b, a), (c, d), (d, e)\}$

One-one function

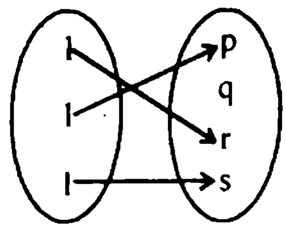
$$\text{Dom } R_5 = \{a,b,c,d\}$$
$$\text{Dom } R_5 = \{a,b,d,e\}$$

(vi) $R_6 = \{(1, 2), (2, 3), (1, 3), (3, 4)\}$

Relation

$$\text{Dom } R_6 = \{1,2,3\}$$
$$\text{Dom } R_6 = \{2,3,4\}$$

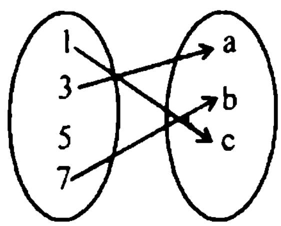
(vii) $R_7 =$



one-one function

$$\text{Dom } R_7 = \{1,2,3\}$$
$$\text{Dom } R_7 = \{r,p,s\}$$

(viii) $R_8 =$



Relation

$$\text{Dom } R_8 = \{1,3,7\}$$
$$\text{Dom } R_8 = \{c,a,b\}$$

MISCELLANEOUS EXERCISE - 5

Q1. Multiple Choice Questions

Four possible answers are given for the following questions. Tick mark (✓) the correct answer.

(i) A collection ^f well-defined distinct objects is called

(a) subset (b) power set

(c) set (d) none of these

(ii) A set $Q = \left\{ \dfrac{a}{b} \mid a, b \in Z \wedge b \neq 0 \right\}$ **is called a set of**

(a) Whole numbers (b) Natural numbers

(c) Irrational numbers (d) Rational numbers

(iii) **The different number of ways to describe a set are**

(a) 1 (b) 2

(c) 3 (3) 4

(iv) A set with no element is called

(a) Subset (b) Empty set

(c) Singleton set (d) Super set

(v) The set $\{x \mid x \in W \wedge x \leq 101\}$ is

(a) Infinite set (b) Subset

(c) Null set (d) Finite set

(vi) The set having only one element is called

(a) Null set (b) Power set

(c) Singleton set (d) Subset

(vii) Power set of an empty set is

(a) ϕ (b) $\{a\}$ (c) $\{\phi, \{a\}\}$ (d) $\{\phi\}$

(viii) The number of elements in power set $\{1, 2, 3\}$ is

(a) 4 (b) 6

(c) 8 (d) 9

(ix) If $A \subseteq B$, then $A \cup B$ is equal to

(a) A (b) B

(c) ϕ (d) none of these

(x) If $A \subseteq B$, then $A \cap B$ is equal to

(a) A b) B (c) ϕ (d) none of these

(xi) If $A \subseteq B$, then $A - B$ is equal to

(a) A (b) B

(c) ϕ (d) $B - A$

(xii) $(A \cup B) \cup C$ is equal to

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

(c) $A \cup (B \cup C)$ (d) $A \cap (B \cap C)$

(xiii) $A \cup (B \cap C)$ is equal to

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

(c) $(A \cap B) \cup (A \cap C)$ (d) $A \cup (B \cup C)$

(xiv) If A and B are disjoint sets, then $A \cup B$ is equal to

(a) A (b) B

(c) ϕ (d) $B \cup A$

(xv) If number of elements in set A is 3 and in set B is 4, then number of elements in $A \times B$ is

(a) 3 (b) 4

(c) 12 (d) 7

(xvi) If number of elements in set A is 3 and in set B is 2, then number of binary relations in A × B is

(a) 2^3 (b) 2^6

(c) 2^8 (d) 2^2

(xvii) The domain of R = {(0, 2), (2, 3), (3, 3); (3, 4)} is

(a) {0,3,4} (b) {0,2,3}

(c) {0,2,4} (d) {2.3.4}

(xvii) The range of R = {(1, 3), (2, 2), (3, 1), (4, 4)} is

(a) {1,2,4} (b) {3,2,4}

(c) {1,2,3,4} (d) {1,3,4}

(xix) Point (-1,4) lies in the quadrant

(a) I (b) II

(c) III (d) IV

(xx) The relation {(1, 2), (2, 3), (3, 3), (3, 4)} is

(a) onto function (b) into function

(c) not a function (d) one-one function

Answers

i)	c	ii)	d	iii)	c	iv)	b	v)	d
vi)	c	vii)	d	viii)	c	ix)	b	x)	a
xi)	c	xii)	c	xiii)	a	xiv)	d	xv)	c
xvi)	b	xvii)	b	xviii)	c	xix)	b	xx)	c

Q2. Write short answers of the following questions.

(i) Define a subset and give one example.

Ans: Set A is said to be subset of a set B, denoted by $A \subseteq B$, if and only if each element of A is an element of B.

For example, if A = {2, 3, 4} and B = {1, 2, 3, 4, 5} then A is subset of B.

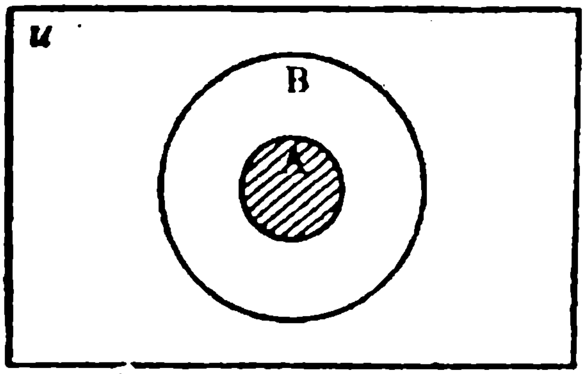
(ii) Write all the, subsets of the set {a, b}.

Ans: Let A = {a, b}

Subsets of A are: ϕ, {a}, {b}, {a,b}

(iii) Show $A \cap B$ by Venn diagram. When $A \subseteq B$.

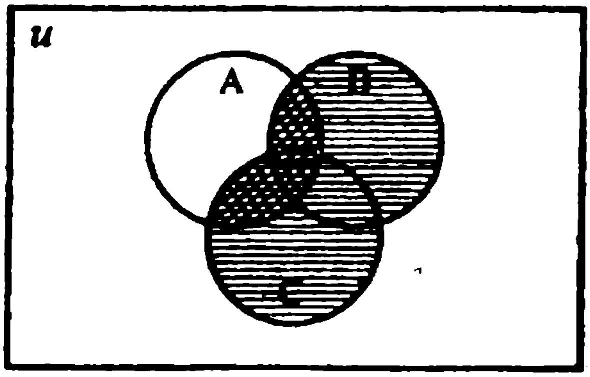
Ans:



$A \cap B$

(iv) Show by Venn diagram $A \cap (B \cup C)$.

Ans:



$A \cap (B \cup C)$

Double shaded region shows $A \cap (B \cup C)$.

(v) Define intersection of two sets.

Ans: The intersection of two sets A and B written as $A \cap B$ is the set consisting of all the common elements of a and B.

(vi) Define a function.

Ans: Suppose A and B are two non-empty sets, then relation of $A \longrightarrow B$ is called one-one function, if all distinct elements of A have distinct images in B i.e.

(vii) Define one-one function.

Ans: $f(x_1) = f(x_2) \Rightarrow x1 = x_2 \in A$

Or

$\forall\ x_1 \neq x_2 \in \mathbf{A} \Rightarrow f(x_1) f(x_2)$

(viii) Define an onto function.

Ans: A function f: $A \longrightarrow B$ is called an onto function. If every element of set B is an image of at least one element of set A i.e. Range $f = B$.

(ix)Define a bijective function.

Ans: A function $f: A \longrightarrow B$ is called bijective function if function f is one-one and onto.

$f = \{(1,2), (2,3), (3,4), (4,5)\}$.

This function is one-one because distinct element of A have distinct images in B. This is an onto function also because every element of B is the image of at least one element of A.

(x) Write De Morgan's laws.

Ans:

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

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

Q3. Fill in the blanks

(i) If $A \subseteq B$, then $A \cup B =$ ________.

(ii) If $A \cap B = \phi$ then A and B are ________.

(iii) If $A \subseteq B$ and $B \subseteq A$ then ________.

(iv) $A \cap (B \cup C) =$ __________.

(v) $A \cup (B \cap C) =$ _________.

(vi) The complement of U is __________.

(vii)The complement of ϕ is __________.

(viii) $A \cap A^c =$ _________.

(ix) $A \cup A^c$ _________.

(x) The set $\{x \mid x \in A \text{ and } x \in B) =$ ________.

(xi) The point $(-5, -7)$ lies in ________ quadrant.

(xii) The point $(4, -6)$ lies in,________ quadrant.

(xiii) The y co-ordinate of every point is _______ on-x-axis.

(xiv) The x co-ordinate of every point is ________ on-y-axis.

(xv) The domain of $\{(a, b), (b, c), (c, d)\}$ is _________.

(xvi) The range of $\{(a, a), (b, b), (c, c)\}$ is ________.

(xvii) Venn-diagram was first used by _______.

(xviii)A subset of $A \times A$ is called the ________ in A.

(xix) If: $A \rightarrow B$ and range of $f = B$, then f s an _______ function.

(xx) The relation $\{(a, b), (6, c), (a, d)\}$ is ________a function.

Answer

(i)	B	**(ii)**	Disjoint	**(iii)**	A = B
(iv)	$(A \cap B)$	**(v)**	ϕ	**(vi)**	$\cup$
(vii)		**(viii)**	ϕ	**(ix)**	$\cup$

(x)	A\B	**(xi)**	III-quad	**(xii)**	IV quad
(xiii)	Zero	**(xiv)**	0	**(xv)**	{a, b, c}
(xvi)	{a, b, c}	**(xvii)**	John Venn	**(xviii)**	binary relation
(xix)	Onto	**(xx)**	Not		

SUMMARY

- ✔ A set is the well defined collection of distinct objects with some common properties:
- ✔ Union of two sets A and B denoted by $A \cup b$ is the set containing elements which either belong to A or to B or to both.
- ✔ Intersection of two sets A and B denoted by $A \cap B$ is the set of common elements of both A and B. In symbols $A \cap B = \{x \mid x \in A \text{ and } x \in B\}$.
- ✔ The set difference of B and A denoted by $B - A$ is the Set of all those elements of B which do not belong to A.
- ✔ Complement of a set A w.r.t. universal set U denoted by $A^C = A' = U - A$ contains all those elements of U which do not belong to A.
- ✔ British mathematician John Venn (1834 - 1923) introduced rectangle for a universal set U and its subsets A and B as closed figures inside this rectangle.
- ✔ An ordered pair of elements is written according to a specific order for which the order of elements is strictly maintained.
- ✔ Cartesian product of two non-empty sets A and B denoted by A KB consists of all ordered pairs (x, y) such that $x \in A, y \in B$.
- ✔ If A and B are any two non-empty sets: then a non empty subset $R \subseteq A \times B$ is called binary relation from set A into set B.
- ✔ If A and B are two non empty sets, then relation $f: A \to B$ is called a function if (i) Dom f = set A (ii) every $x \in$. A appears in one and only one ordered pair $\in f$.
- ✔ Dom f is the set consisting of all first elements of each ordered pair $\in f$ and Rang of f is the set consisting of all second elements of each ordered pair $\in f$.
- ✔ A function $f: A \to B$ is called an into function if at least one element in B is not an image of some element of set A i.e., range of $f \subseteq B$.
- ✔ A function $f: A \to B$ is called an onto function if every element of set B is an image of at least one element of set A i.e., range of $f = B$.
- ✔ A function $f: A \to B$ is called one-one function if all distinct elements of A have distinct images in B.
- ✔ A function $f: A \to B$ is called bijective function if f function f is one-one and onto.

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