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B.Tech Cse Sec - 1

Discrete Math Assignment

Q In a survey of 200 people, 120 people like coffee, 80 ppl like Tea, 50 ppl like both coffee & Tea. How many ppl like :

1. Only Coffee
2. Only Tea
3. Neither Coffee nor Tea

Sol - Total ppl = 200, $n(C) = 120$, $n(T) = 80$, $n(C \cap T) = 50$

$$1) n(C) = |C| - |C \cap T| = 120 - 50 = 70 \text{ people}$$

$$2) n(T) = |T| - |C \cap T| = 80 - 50 = 30 \text{ people}$$

$$3) |C| + |T| - |C \cap T| = 120 + 80 - 50 = 150$$

People who like coffee or tea = 150

The People who like neither like both = $200 - 150$
= 50 people

Q Let $X = \{1, 2, 3\}$, $Y = \{p, q\}$ & $Z = \{a, b\}$ & functions f & g are defined as :

$$f: X \rightarrow Y \text{ be } f = \{(1, p), (2, p), (3, q)\}$$

$$g: Y \rightarrow Z \text{ be } g = \{(p, a), (q, b)\} \text{ then find } fog \text{ & } gof.$$

Sol - $X = \{1, 2, 3\}$, $Y = \{p, q\}$, $Z = \{a, b\}$

$$1) fog = (1, a), (2, a), (3, b)$$

2) gof is not defined as there is no direct mapping from X to $g(f(x))$.

Q If R be a relation on set $A = \{a, b, c, d\}$ & $R = \{(a, b), (b, c), (d, c), (d, a), (a, d), (d, d)\}$. Determine whether R is (i) Symmetric (ii) Reflexive (iii) Anti-Symmetric (iv) Transitive (v) Equivalence or not.

Sol - (i) Not all pairs satisfy symmetry as there is no $(b, a) \in R$. Hence R is not symmetric.

(ii) It is not reflexive as $(a, a), (b, b), (c, c) \notin R$.

(iii) We have both $(a, d) \in R$ & $(d, a) \in R$ but $a \neq d$. Hence R is not anti-symmetric.

(iv) As $(a, c) \notin R$ & $(d, b) \notin R$, it is not transitive.

(v) Since R is not symmetric, reflexive or transitive, it is not an equivalence relation.

Q. Show that $f: \mathbb{R} \rightarrow \mathbb{R}$ defined by $f(x) = 3x+7$ is a one-one onto function

Sol - To prove one-one;

If $f(x_1) = f(x_2)$ then $x_1 = x_2$

$$3x_1 + 7 = 3x_2 + 7$$

Subtracting 7 from both sides

$$3x_1 = 3x_2$$

Divide by 3 on both sides

$$x_1 = x_2$$

Thus, f is injective or one-one

To Prove onto

$$f(x) = 3x+7 = y$$

$$3x = y - 7$$

$$x = \frac{y-7}{3}$$

As x is real no., f is surjective (onto).