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Exam Time : 02:00:00 Hrs

Total Marks : 70

14 x 5 = 70

I. ANSWER ALL QUESTION

- 1) Let $A = \{x \in \mathbb{N} \mid 1 < x < 4\}$, $B = \{x \in \mathbb{W} \mid 0 \leq x < 2\}$ and $C = \{x \in \mathbb{N} \mid x < 3\}$ Then verify that
 - (i) $A \times (B \cup C) = (A \times B) \cup (A \times C)$
 - (ii) $A \times (B \cap C) = (A \times B) \cap (A \times C)$
- 2) Let $A = \{x \in \mathbb{W} \mid x < 2\}$, $B = \{x \in \mathbb{N} \mid 1 < x \leq 4\}$ and $C = (3,5)$. Verify that
 $A \times (B \cup C) = (A \times B) \cup (A \times C)$
- 3) Let $A =$ The set of all natural numbers less than 8, $B =$ The set of all prime numbers less than 8, $C =$ The set of even prime number. Verify that
 $(A \cap B) \times C = (A \times C) \cap (B \times C)$
- 4) Let $A = \{1,2,3,4\}$ and $B = \{2, 5, 8, 11,14\}$ be two sets. Let $f: A \rightarrow B$ be a function given by $f(x) = 3x - 1$. Represent this function
 - (i) by arrow diagram
 - (ii) in a table form
 - (iii) as a set of ordered pairs
 - (iv) in a graphical form
- 5) Forensic scientists can determine the height (in cms) of a person based on the length of their thigh bone. They usually do so using the function $h(b) = 2.47b + 54.10$ where b is the length of the thigh bone.
 - (i) Check if the function h is one – one or not
 - (ii) Also find the height of a person if the length of his thigh bone is 50 cm.
 - (iii) Find the length of the thigh bone if the height of a person is 147.96 cm.
- 6) If the function $f: \mathbb{R} \rightarrow \mathbb{R}$ defined by

$$f(x) = \begin{cases} 2x + 7, & x < -2 \\ x^2 - 2, & -2 \leq x < 3 \\ 3x - 2, & x \geq 3 \end{cases}$$
 - (i) $f(4)$
 - (ii) $f(-2)$
 - (iii) $f(4) + 2f(1)$
 - (iv) $\frac{f(1)-3f(4)}{f(-3)}$
- 7) Let $f: A \rightarrow B$ be a function defined by $f(x) = \frac{x}{2}-1$, where $A = \{2, 4, 6, 10, 12\}$, $B = \{0, 1, 2, 4, 5, 9\}$, Represent f by
 - (i) set of ordered pairs
 - (ii) a table
 - (iii) an arrow diagram
 - (iv) a graph
- 8) If the function f is defined by

$$f(x) = \begin{cases} x + 2 & \text{if } x > 1 \\ 2 & \text{if } -1 \leq x \leq 1 \\ x - 1 & \text{if } -3 < x < -1 \end{cases}$$
 find the values of
 - i) $f(3)$
 - ii) $f(0)$
 - iii) $f(-1.5)$
 - iv) $f(2) + f(-2)$

$$f(x) = \begin{cases} 6x + 1 & \text{if } -5 \leq x < 2 \\ 5x^2 - 1 & \text{if } 2 \leq x < 6 \\ 3x - 4 & \text{if } 6 \leq x \leq 9 \end{cases}$$

Find

i) $f(-3) + f(2)$

ii) $f(7) - f(1)$

iii) $2f(4) + f(8)$

iv) $\frac{2f(-2) - f(6)}{f(4) + f(-2)}$

10) Find x if $gff(x) = fgg(x)$, given $f(x) = 3x + 1$ and $g(x) = x + 3$.11) Consider the functions $f(x)$, $g(x)$, $h(x)$ as given below. Show that $(f \circ g) \circ h = f \circ (g \circ h)$ in each case.

(i) $f(x) = x - 1$, $g(x) = 3x + 1$ and $h(x) = x^2$

(ii) $f(x) = x^2$, $g(x) = 2x$ and $h(x) = x + 4$

(iii) $f(x) = x - 4$, $g(x) = x^2$ and $h(x) = 3x - 5$

12) Let $A = \{x \in \mathbb{W} \mid x < 2\}$, $B = \{x \in \mathbb{N} \mid 1 < x \leq 4\}$ and $C = (3,5)$. Verify that

$$A \times (B \cap C) = (A \times B) \cap (A \times C)$$

13) Let $A = \{x \in \mathbb{W} \mid x < 2\}$, $B = \{x \in \mathbb{N} \mid 1 < x \leq 4\}$ and $C = (3,5)$. Verify that

$$(A \cup B) \times C = (A \times C) \cup (B \times C)$$

14) Let $A =$ The set of all natural numbers less than 8, $B =$ The set of all prime numbers less than 8, $C =$ The set of even prime number.

Verify that

$$A \times (B - C) = (A \times B) - (A \times C)$$

ALL THE BEST
