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**Question 1:** Draw the Venn Diagrams for the following combinations of the sets  $X$ ,  $Y$  and  $Z$ :

(a)  $X \cap (Y \cap Z)$

(c)  $(X \cap Y) \cup (Y \cap Z)$

(b)  $X \cap (Y - Z)$

(d)  $(X - Y - Z)$

**Question 2:** Use set builder notations to prove that: a)  $X \oplus Y = (X \cup Y) - (X \cap Y)$ , b)  $(Y - X) \cup (Z - X) = (Y \cup Z) - X$ . Here,  $\oplus$  means the *exclusive OR*, which is also known as *symmetric difference*.

**Question 3:** Given  $f : \mathbb{Z} \rightarrow \mathbb{Z}$ , and  $f$  is defined as  $f(x) = 6x$ . Identify the domain and co-domain. Is it one-to-one, Onto function, or both? Explain with examples.

**Question 4:** Provide an example of: i) One-to-one but not Onto function, ii) Onto but not One-to-one function, iii) Both One-to-one and Onto function. Explain how the proposed functions satisfy their relevant criteria.

**Question 5:** Given  $f(x) = x^2 + 1$  and  $g(x) = x + 2$ , evaluate  $f \circ g(x)$  and  $g \circ f(x)$ . Comment if  $f \circ g(x)$  and  $g \circ f(x)$  are equal for the given  $f(x)$  and  $g(x)$ .

**Question 6:** Given  $f(x) = (x + 4)/(2x - 5)$ , find the inverse function  $f^{-1}(x)$ .

**Question 7:** Assume that  $H(m) = 3m - 2$  is a function and its inverse exists. Calculate the inverse function  $H^{-1}(m)$ . Show that  $H \circ H^{-1}(m) = m$ .