Assignment 1 (Sets and Operations, Functions)

1.	Let $A = \{1, 2, 3, 4, 5\}$ and $B = \{0, 3, 6\}$. Find **a)** $A \cup B$. **b)** $A \cap B$. **c)** $A - B$. **d)** $B - A$. (Refer slides 20, 21, 22, 23, 25)
2.	Find the sets A and B if $A - B = \{1, 5, 7, 8\}$, $B - A = \{2, 10\}$, and $A \cap B = \{3, 6, 9\}$. (Refer slides 20, 21, 22, 23, 25)
3.	If A and B are sets, then prove that **A ∩ (A ∪ B) = A** using membership table (Refer slide number 27)
4.	Let $A = \{0, 2, 4, 6, 8, 10\}$, $B = \{0, 1, 2, 3, 4, 5, 6\}$, and $C = \{4, 5, 6, 7, 8, 9, 10\}$. Find **a)** $A \cap B \cap C$. **b)** $A \cup B \cup C$. **c)** $(A \cup B) \cap C$. **d)** $(A \cap B) \cup C$. (Refer slides 20, 21, 22, 23, 25)
5.	Draw the Venn diagrams for each of these combinations of the sets A, B, and C. **a)** $A \cap (B - C)$ **b)** $(A \cap B) \cup (A \cap C)$ **c)** $(A \cap \overline{B}) \cup (A \cap \overline{C})$ (Refer slides 20, 21, 22, 23, 25)
6.	Suppose that the universal set is $U = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$. Express each of these sets with bit strings where the ith bit in the string is 1 if i is in the set and 0 otherwise. **a)** $\{3, 4, 5\}$ **b)** $\{1, 3, 6, 10\}$ (Refer slides 28 and 29)
7.	Show how bitwise operations on bit strings can be used to find these combinations of $A = \{a, b, c, d, e\}$, $B = \{b, c, d, g, p, t, v\}$, $C = \{c, e, i, o, u, x, y, z\}$, and $D = \{d, e, h, i, n, o, t, u, x, y\}$. **a)** $A \cup B$ **b)** $A \cap B$ **c)** $(A \cup D) \cap (B \cup C)$ **d)** $A \cup B \cup C \cup D$ (Refer slides 28 and 29)
8.	Let $A = \{a, b, c\}$, $B = \{x, y\}$, and $C = \{0, 1\}$. Find **a)** $A \times B \times C$. **b)** $C \times B \times A$. (Refer slides 17 and 18 for cross product of sets)
9.	Find the domain and range of the following function defined as. **a)** The function that assigns to each pair of positive integers the maximum of these two integers
10.	Give an example of a function from **N** to **N** that is **a)** one-to-one but not onto. **b)** onto but not one-to-one. (here **N** is the set of natural numbers) (Refer slide 35)