Tutorial – 6

1) Let E, F and G be finite sets where $X = (E \cap F) - (F \cap G)$ and $Y = (E - (E \cap G)) - (E - F)$. Determine which of the following is true:

a) $X \subset Y$
b) $X \supset Y$
c) $X = Y$
d) $X - Y \neq \emptyset$ and $Y - X \neq \emptyset$

2) In a class of 200 students, 125 have taken programming language, 85 took data structure, 65 have taken computer organization, 50 took both programming language and data structure, 35 took data structure and computer organization, 30 took programming language and computer organization, 15 took all three. How many have not taken any course?

3) Consider two fuzzy subsets of the set $X = \{a, b, c, d, e\}$ referred to as $\tilde{A}$ and $\tilde{B}$ such that $\tilde{A} = \{(1, a), (0.3, b), (0.2, c), (0.8, d), (0, e)\}$ and $\tilde{B} = \{(0.6, a), (0.9, b), (0.1, c), (0.3, d), (0.2, e)\}$. Compute the following:
a) $\text{supp}(\tilde{A})$ and $\text{supp}(\tilde{B})$
b) $\text{core}(\tilde{A})$ and $\text{core}(\tilde{B})$
c) $n(\tilde{A})$ and $n(\tilde{B})$
d) $\neg(\tilde{A})$ and $\neg(\tilde{B})$
e) $\tilde{A} \cup \tilde{B}$
f) $\tilde{A} \cap \tilde{B}$
g) $a\tilde{A}$ and $a\tilde{B}$ when $a = 0.5$
h) $\tilde{A}^a$ and $\tilde{B}^a$ when $a = 2$
i) $\alpha - \text{cuts}$ of $\tilde{A}$ and $\tilde{B}$ for $\alpha = 0.3$ and $\alpha = 0.9$
j) $h(\tilde{A})$ and $h(\tilde{B})$
k) Which one is a normal fuzzy set?

4) Find the cardinality of set A in the following cases:
a) If $A = \{x \mid x \in Z^+ \text{ and } 1 \leq x^2 \leq 4\}$
b) If $A = \{x \mid x \in Z^+ \text{ and } (1 \leq x^2 \leq 4 \text{ or } 1 \leq x^2 \leq 9\}$
c) If $A = \{x \mid x \in Z^+ \text{and } (1 \leq x^2 \leq 4 \text{ and } 1 \leq x^2 \leq 9\}$

5) Prove the following:
a) $A \times (B \cap C) = (A \times B) \cap (A \times C)$
b) $A - B = A \cap \bar{B}$
c) $A - (B \cap C) = (A - B) \cup (A - C)$

6) Determine which of the following sets are equal:
$S_1 = \{1, 2, 3\}$, $S_2 = \{x \mid x^2 - 2x + 1 = 0\}$, $S_3 = \{x \mid x^3 - 6x^2 + 11x - 6 = 0\}$

7) If $A = \{1, 2, 3\}$, $B = \{4,5\}$, $C = \{1, 2, 3, 4, 5\}$ find
   a) $A \times B$
   b) $C \times B$
   c) $B \times B$

Hence, prove that $(C \times B) - (A \times B) = (B \times B)$

8) Suppose that A, B, and C are sets such that $A \subseteq B$ and $B \subseteq C$. Take an example and using Venn diagram show that $A \subseteq C$.

9) Let P, Q and R be sets. Let Δ denote the symmetric difference operator defined as $P\Delta Q = (P \cup Q) - (P \cap Q)$. Using Venn diagrams, determine which of the following is/are TRUE?
$P\Delta (Q \cap R) = (P \Delta Q) \cap (P \Delta R)$
$P \cap (Q \cap R) = (P \cap Q) \Delta (P \Delta R)$
(A) I only
(B) II only
(C) Neither I nor II
(D) Both I and II

10)   Mr. Bin lives at city P. He gets four different opportunities of job at a time as A, B, C, D at Q, R, S and T respectively. These four alternatives are differing in salary, distance from its residency, and stability in job as well as his interest in job. Now the goal of Mr. Bin is to choose better and beneficial job. What will he chose?

JOB NAME	SALARY/ MONTH	INTEREST IN JOB	DISTANCE IN km	STABILITY IN JOB
A	20,000 (0.5)	LITTLE (0.4)	380 (0.24)	PERMANENT (1.0)
B	35,000 (0.87)	MODERATE (0.8)	290 (0.42)	CONTRACT (0.5)
C	15,000 (0.37)	HIGH (1.0)	135 (0.73)	MAY BE PERMANANT (0.7)
D	30,000 (0.75)	FEW (0.1)	220 (0.56)	TEMPORARY (0.3)