**2.2 Set Operations**

**Q8. Let A and B be sets, Show that :**

**a) (A ∩ B) ⊆ A**

If x is in A ∩ B, then it is in A (by definition of intersection).

**b) A ⊆ (A** È **B)**

If x is in A, then it is in A È B (by definition of union).

**c) A − B ⊆ A**

If x is in A − B, then it is in A (by definition of difference).

**d) A ∩ (B − A) = ∅**

If x **Î** A then x Ï B − A. Therefore there can be no elements in A ∩ (B − A), which is equal to Ø.

**e) A** È **(B − A) = A** È **B**

elements that are either elements of A or elements of B but not A,

of course it could be of both A and B because it union with A. which is the exactly same **A** È **B**

**Q10. Let A, B, and C be sets. Show that :**

**a) (A** È **B) ⊆ (A** È **B** È **C)**

Suppose that x **Î** A È B. Then either x **Î** A or x **Î** B. so of course x could be in C is true x **Î** A È B È C.

**b) (A ∩ B ∩ C) ⊆ (A ∩ B)**

Suppose that x **Î** A ∩ B ∩ C. Then x is in all three of these sets. So it is in both A and B and therefore in A ∩ B**.**

**c) (A − B) − C ⊆ A – C**

Suppose that x **Î** (A−B) − C. Then x is in A−B but not in C. Since x **Î** A but x Ï C then x **Î** A − C.

**d) (A − C) ∩ (C − B) = ∅**

we need to find contradiction, suppose that x **Î** (A−C)∩(C −B). Then x **Î** A − C and x **Î** C − B. The first of these statements implies that x ÏC, while the second implies x **Î** C. This is impossible, so there is contradiction.

**e) (B − A)** È **(C − A) = (B** È **C) – A**

Firstly we need to prove that (B −A) È (C −A) Í (B È C)−A,

suppose that x **Î** (B −A) È (C −A). Then either x **Î** (B −A) or x **Î** (C −A). so x **Î** B and x ÏA. From the first of these assertions we can see that x **Î** B È C. Thus x **Î** (BÈC)−A.

Secondly, we need to show that (B È C) − A Í (B − A) È (C − A),

suppose that x **Î** (B È C) − A. This means x **Î** (B È C) and x Ï A. The first of these assertions tells us that either x **Î** B or x **Î** C. Thus either x **Î** B − A or x **Î** C − A. In either case, x **Î** (B − A) È (C – A).

**Q32. 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}**

0011100000

**b) {1, 3, 6, 10}**

1010010001

**c) {2, 3, 4, 7, 8, 9}**

0111001110