# SECI1013 : DISCRETE STRUCTURE

## ASSIGNMENT 1 (PART 1) : CHAPTER 1

## (SECPH - 02)

| BIL | NAMA | NO MATRIK |
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Question 1

$U = \{ x \in Z, 0 \leq x \leq 20 \}$

$A = \{ 2, 3, 5, 7, 11, 13, 17, 19 \}$

$B = \{ 10, 12, 14, 16, 18, 20 \}$

$C = \{ 1, 3, 5, 7, 9 \}$

1.(a) $A \cap C \cup B = \{ 3, 5, 7, 10, 12, 14, 16, 18, 20 \}$

1.(b) $A \cap B \cup C = \{ 1, 3, 5, 7, 9 \}$

$P(A \cap B \cup C) = \{ \emptyset, \{1\}, \{3\}, \{5\}, \{7\}, \{9\}, \{1,3\}, \{1,5\},$
$\{1,7\}, \{1,9\}, \{3,5\}, \{3,7\}, \{3,9\}, \{5,7\},$
$\{5,9\}, \{7,9\}, \{1,3,5\}, \{1,3,7\}, \{1,3,9\},$
$\{1,5,7\}, \{1,5,9\}, \{1,7,9\}, \{1,3,5,7\}, \{1,3,5,9\}$
$\{3,5,7,9\}, \{5,7,9\}, \{3,7,9\}, \{3,5,7\}, \{3,5,9\},$
$\{1,3,5,7,9\}, \{1,3,7,9\}, \{1,5,7,9\} \}$

1.(c) $A - C = \{ 2, 11, 13, 17, 19 \}$

1.(d) $|A| = 8$ , $|B| = 6$ , $|C| = 5$

1.(e) $A \cap C = \{ 3, 5, 7 \}$

$P(A \cap C) = \{ \emptyset, \{3\}, \{5\}, \{7\}, \{3,5\}, \{3,7\}, \{5,7\}, \{3,5,7\} \}$

$|P(A \cap C)| = 8$

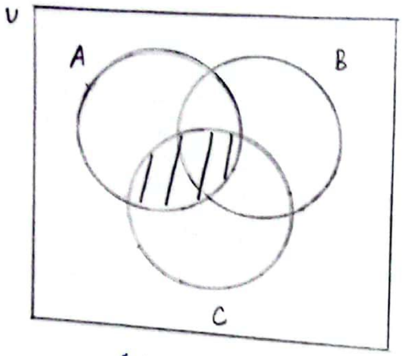
1.(f) $B \subset C'$

= True

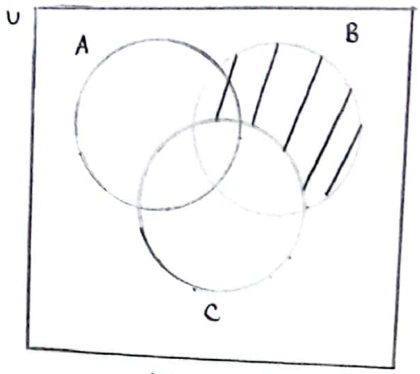
1.(g) $(A \cup B \cup C) \subseteq U$

= True

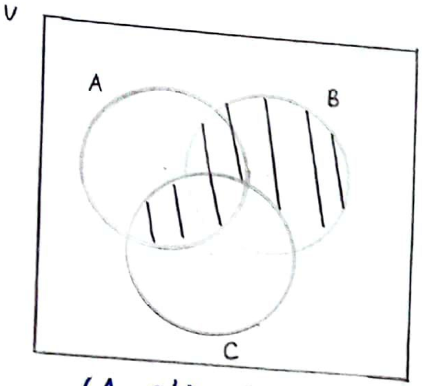
2 (a) $(A - C') \cup (B - C) = A \cup B$




$(A - C')$

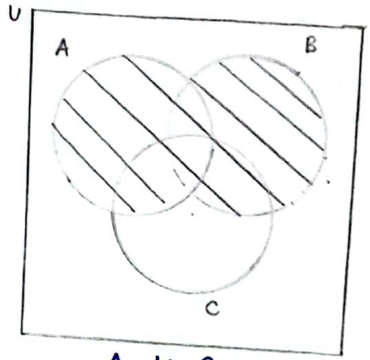



$(B - C)$




$(A - C') \cup (B - C)$

$\neq$




$A \cup B$

$\therefore (A - C') \cup (B - C) \neq A \cup B$

(b) $(A \cap B) \cup (A - B) = A$

$$\begin{aligned} (A \cap B) \cup (A - B) &= (A \cap B) \cup (A \cap B') && \text{(set difference law)} \\ &= A \cap (B \cup B') && \text{(distributive law)} \\ &= A \cap U && \text{(complement law)} \\ &= A && \text{(properties of universal)} \end{aligned}$$

3 (a) $S = \{a, b, c, d, e, f, g\}$

$T = \{h, j, k, l, m, n, p, q\}$

$E = \{p, q, r, s, t, v, w, y, z\}$

(ii) $T \cap E = \{p, q\}$

$S \times (T \cap E) = \{(a,p), (a,q), (b,p), (b,q), (c,p), (c,q), (d,p), (d,q), (e,p), (e,q), (f,p), (f,q), (g,p), (g,q)\}$

Question 4

(a) $\{a\} \subseteq A$

TRUE

(b) $\{a, b\} \in A$

TRUE

Question 5.

(a) $Q = (p \wedge r) \vee (q \vee \neg r)$, $R = (p \vee q) \vee \neg r$

| $p$ | $q$ | $r$ | $\neg r$ | $(p \wedge r)$ | $(q \vee \neg r)$ | $(p \wedge r) \vee (q \vee \neg r)$ | $(p \vee q)$ | $(p \vee q) \vee \neg r$ |
|---|---|---|---|---|---|---|---|---|
| T | T | T | F | T | T | T | T | T |
| T | T | F | T | F | T | T | T | T |
| T | F | T | F | T | F | T | T | T |
| T | F | F | T | F | T | T | T | T |
| F | T | T | F | F | T | T | T | T |
| F | T | F | T | F | T | T | T | T |
| F | F | T | F | F | F | F | F | F |
| F | F | F | T | F | T | T | F | T |

$\therefore Q \equiv R$

(b) $Q = (p \wedge r) \vee \neg(p \wedge \neg q)$, $R = (p \wedge r) \longrightarrow (q \vee r)$

| $p$ | $q$ | $r$ | $\neg q$ | $(p \wedge r)$ | $(p \wedge \neg q)$ | $\neg(p \wedge \neg q)$ | $(p \wedge r) \vee \neg(p \wedge \neg q)$ | $(q \vee r)$ | $(p \wedge r) \rightarrow (q \vee r)$ |
|---|---|---|---|---|---|---|---|---|---|
| T | T | T | F | T | F | T | T | T | T |
| T | T | F | F | F | F | T | T | T | T |
| T | F | T | T | T | T | F | T | T | T |
| T | F | F | T | F | T | F | F | F | T |
| F | T | T | F | F | F | T | T | T | T |
| F | T | F | F | F | F | T | T | T | T |
| F | F | T | T | F | F | T | T | T | T |
| F | F | F | T | F | F | T | T | F | T |

$\therefore Q \not\equiv R$

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Question 6

6. (a) The above statements is not true.
The counterexample is 1.

6. (b) The above statements is not true.
The counterexample is 8.

Question 7

7. $\exists x\ (P(x) \wedge Q(x))$

Question 8

$a = 2n + \underline{1}$

$$\begin{aligned} a^2 - 3a &= (2n+1)^2 - 3(2n+1) \\ &= 4n^2 + 4n + 1 - 6n - 3 \\ &= 4n^2 - 2n - 2 \\ &= 2(2n^2 - n - 1) \\ &= 2m \quad \text{, where } m = 2n^2 - n - 1 \end{aligned}$$

$a^2 - 3a$ is even

$\therefore$ for all integers of a, if a is odd, then $a^2 - 3a$ is even

Question 9

- Suppose $n^2$ is odd, and n is even which is not odd.
- Let, $n = 2m$ (even)

$n^2 = (2m)^2$

$n^2 = 4m^2$ (even)

- Contradiction.
- Thus, we conclude that the statement is true.