SECI 1013 : DISCRETE STRUCTURE

SEM 1 ASSIGMENT 1 (PART 1) - CHAPTHER 1

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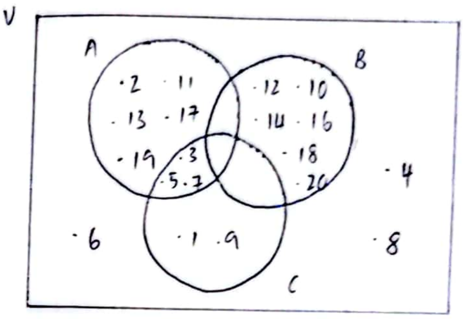
$\frac{22.5}{58}$

$10\frac{1}{2}$

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

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

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



(a) $A \cap C \cup B$ $\quad A \cap (C \cup B)$.

$= \{3, 5, 7, 10, 12, 14, 16, 18, 20\}$

(b) $P(A \cap B \cup C)$

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

(c) $A - C$

$= \{2, 11, 13, 17, 19\}$

(d) $|A| = 8$

$|B| = 6$

$|C| = 5$

(e) $|P(A \cap C)|$

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

$|P(A \cap C)| = 2^3$

$= 8$

(f) $B \subset C'$

$\therefore$ True 1

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

$\therefore$ True 1

1(b) $P(A \cap B \cup C)$

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

$\frac{1}{2}$

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

$= (A \cap C) \cup (B \cap C')$ law?

$(A \cap C) \cup (B \cap C') \neq A \cup B$

$\therefore$ not equal

$2\frac{1}{2}$

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

$: (A \cap B) \cup (A \cap B')$ Set difference Laws

$= A \cap (B \cup B')$ law?

$= A \cap U$ Complement laws $2\frac{1}{2}$

$= A$

$\therefore$ equal

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

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

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

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(b) $S \times (T \cap E)$

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

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

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4 (a) TRUE
(b) TRUE

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

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

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p	q	r	$p \vee q$	$\neg r$	$(p \vee q) \vee \neg r$
T	T	T	T	F	T
T	T	F	T	T	T
T	F	T	T	F	T
T	F	F	T	T	T
F	T	T	T	F	T
F	T	F	T	T	T
F	F	T	F	F	F
F	F	F	F	T	T

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$Q \equiv R$

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

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

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

Not $Q \equiv R$

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Question 6

a) Domain of discourse is set $D = \{1, 3, 5, 7, 8, 9\}$

$\forall x D(x)$

When $x=1$, $x=3$, $x=5$, $x=7$ and $x=9$, the statement produce a false value.

Thus, the above statement is false and the counterexample is 1, 3, 5, 7 and 9.

b) Domain of discourse is set $D = \{1, 3, 5, 7, 8, 9\}$

$\forall x D(x)$

When $x=1$, $x=3$, $x=5$, $x=7$, $x=8$ and $x=9$, the statement produce a false value.

Thus, the above statement is false and the counterexample is 1, 3, 5, 7, 8 and 9.

Question 7.

Let x = all student of faculty

Let $P(x)$ = "x can speak Arabic"

Let $Q(x)$ = "x knows computer language C++"

Quantifier : Existential quantifier

Logic connective : $\wedge$

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Existentially quantified statement : Some student at faculty can speak Arabic and knows computer language C++, $\exists x (P(x) \wedge Q(x))$.

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8. $a = 2n+1$

$a^2 - 3a = (2n+1)^2 - 3(2n+1)$

$= 4n^2 + 4n + 1 - 6n - 3$

$= 4n^2 - 2n - 2$

$= 2(2n^2 - n - 1)$ $m = ?$

$= 2m$ ↳ an integer

2 times an integer, so for all integers, if a is odd then $a^2 - 3a$ is even.

$4\frac{1}{2}$

9. Suppose n^2 is an odd integer and n is not odd. $(p \cdot \sim q)$

Then n^2 is an odd integer and n is even.

$n = 2a$

$n^2 = (2a)^2$

$= 4a^2$

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

$= 2M$ ↑ an integer

Thus. the statement is true.

$4\frac{1}{2}$