SECI1013 DISCRETE STRUCTURE

Assignment 1

Group members:

1. Terence Lim Jian Yuan A25CS0364
2. Ng Yaw Kuan A25CS0292
3. Chia Yu Henn A25CS0052

1. $A = \{-3, 2\}$

$B = \{-3, 1, 2, 4\}$

$C = \{2, 3, 4\}$

(a) $A' = \{x \in \mathbb{Z} \mid x \neq -3, x \neq 2\}$

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

$= \{1, 4\}$

$(B - A) \cap C = \{4\}$

(c) $B \cap C = \{2, 4\}$

$P(B \cap C) = \{\phi, \{2\}, \{4\}, \{2, 4\}\}$

$|P(B \cap C)| = 4$

2. $((P \cup Q) \cap R)' \cup Q')'$ #

$= ((P \cup Q) \cap R)'' \cap Q''$ (De Morgan's Law)

$= ((P \cup Q) \cap R) \cap Q$ (Double complement laws)

$= ((P \cup Q) \cap Q) \cap R$ (Associative laws)

$= Q \cap R$ (Absorption laws)

$=$ RHS (Shown)

3. Let A = Students in the art class

S = Students in the science class

(a) $|A \cap S| = 12$

$$|A \cup S| = |A| + |S| - |A \cap S|$$
$$= 35 + 57 - 12$$
$$= 80$$

∴ There are 80 students who are either in art class or in science class.

(b) Two classes meet at same hour, $|A \cap S| = 0$

$$|A \cup S| = |A| + |S| - |A \cap S|$$
$$= 35 + 57 - 0$$
$$= 92$$

∴ There are 92 students who are either in art class or in science class.

4. (a) Let p = You try hard.

q = You have a talent

r = You will get rich

Ans: $(p \wedge q) \rightarrow r$

(b) Statement was a lie even try hard : $(p \wedge q) \rightarrow r$ is false.

In order to get a false statement, $(p \wedge q)$ must be true, r must be false.

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

∵ $p \wedge q$ is true,

∴ p is true ⇒ You try hard

q is true ⇒ You have a talent

r is false ⇒ You did not get rich.

∴ Conclusion: You did not get rich, ~~statem~~

4. (c) You are rich : r is true

You do not try hard or have talent : $(\neg p \vee \neg q)$ is true

$\therefore (p \wedge q)$ is false because either p or q is false.

r is true.

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

$\therefore$ The Statement is true.

5.

A:

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

B:

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

$\therefore \neg(p \vee (q \wedge (r \rightarrow p))) \equiv \neg p \wedge (q \rightarrow r)$ $\therefore A \equiv B$

6. Let

$x = 2m+1$ for some integer m

$y = 2n$ for some integer n

$$x^2 - 2y = (2m+1)^2 - 2(2n)$$
$$= 4m^2 + 4m + 1 - 4n$$
$$= 2(2m^2 + 2m - 2n) + 1$$
$$= 2k+1$$

∴ Since $(2m^2+2m-2n)$ is an integer, so $x^2-2y = 2k+1$, which is an representation of odd number.

∴ $x^2 - 2y$ is odd integer.