SECI1013: DISCRETE STRUCTURES

SESSION 2025/2026 – SEMESTER 1

ASSIGNMENT 1 (CHAPTER 1 –SET THEORY & LOGIC)

INSTRUCTIONS:

a. This assignment must be conducted in a group. Please clearly write the group members' names & matric numbers on the front page of the submission.
b. Solutions for each question must be readable and neatly written on plain A4 paper. Every step or calculation should be properly shown. Failure to do so will result in the rejection of the submission of the assignment.
c. This assignment consist of 6 questions (31 marks), contributing 5% of overall course marks.

Question 1 **[5 marks]**

Let U be the set Z of all integer numbers and let A, B, C are the subset of U. Given A=$\{x$ is a solution of $x^2 + x - 6 = 0\}$, B={-3,1,2,4} and C=$\{x \in Z | 2 \leq x < 5\}$. Compute :

a) A'
b) $(B - A) \cap C$.
c) $|P(B \cap C)|$

Question 2 **[6 marks]**

Let P,Q and R are sets, prove that $(((P \cup Q) \cap R)' \cup Q')' = Q \cap R$ by showing all laws that used.

Question 3 **[4 marks]**

There are 35 students in the art class and 57 students in the science class. Find the number of students who are either in art class or in science class.

a) When two classes meet at different hours and 12 students are enrolled in both activities. (2marks)
b) When two classes meet at the same hour (2 marks)

Question 4 **[6 marks]**

Consider the statement:

"**If you try hard and you have a talent then you will get rich**"

a) Translate the statement into logic symbols. Use p, q and r to represent the propositions. Clearly state which statement is p, q and r.
b) Suppose you found out that the statement was a lie even you try hard. What can you conclude?
c) If you are rich but you do not try hard or have talent. Was the statement true or false? Support your conclusion.

Question 5 **[5 marks]**

Use truth table to check if the compound propositions A and B are logically equivalent.

$$A = \neg(p \vee (q \wedge (\mathrm{r} \rightarrow p)))$$

$$B = \neg p \wedge (q \rightarrow r)$$

Question 6 **[5 marks]**

Proof that if x is an odd integer and y is an even integer then $x^2 - 2y$ is an odd integer using direct proofing

Discrete Structure Assignment 1 (Section 02)

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1. (a) $x^2 + x - 6 = 0$
$(x-2)(x+3) = 0$
$x = -3, x = 2$

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

(b) $(B - A) \cap C = \{1, 4\} \cap \{2, 3, 4\}$
$= \{4\}$.

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

$|P(B \cap C)| = 2^n = 2^2 = 4$

2. $(((P \cup Q) \cap R)' \cup Q')' = \cancel{((P \cup Q) \cap R) \cap Q}$ ~~DeMorgan~~
$= (((P \cup Q) \cap R)')' \cap (Q')'$ (DeMorgan's Law)
$= ((P \cup Q) \cap R) \cap Q$ (Double Complement Law)
$= Q \cap ((P \cup Q) \cap R)$ (Commutative Law)
$= (Q \cap (P \cup Q)) \cap R$ (Associative Law)
$= Q \cap R$ (Absorption Law)

3. (a) $|A|$ = student in art class
$|S|$ = student in science class
$|A \cup S| = |A| + |S| - |A \cap S|$
$= 35 + 57 - 12$
$= 80$ $\therefore$ 80 students

(b) $|A \cup S| = |A| + |S| + |A \cap S|$
$= 35 + 57$
$= 92$
$\therefore$ 92 students

4.(a) p: you try hard
q: you have a talent
r: you will get rich

$(p \wedge q) \to r$

(b) The statement false implies that r must be false and $(p \wedge q)$ must be true, because a statement $X \to Y$ is false when X is true and Y is false.

Since p is true (you try hard) and r is false, then q must be true as

$$(p \wedge q) \to r = (T \wedge T) \to F = T \to F = F.$$

$\therefore$ You try hard and have a talent but you do not get rich.

(c) r is true (you are rich)

since r is true, the statement $(p \wedge q) \to r$ must be true, because a statement $X \to Y$ is ~~false~~ true whenever Y is true.

$\therefore$ statement is true.

5.

p	q	r	$r \to p$	$q \wedge (r \to p)$	$p \vee (q \wedge (r \to p))$	A	$\sim p$	$q \to r$	B
F	F	F	T	F	F	T	T	T	T
F	F	T	F	F	F	T	T	T	T
F	T	F	T	T	T	F	T	F	F
F	T	T	F	F	F	T	T	T	T
T	F	F	T	F	T	F	F	T	F
T	F	T	T	F	T	F	F	T	F
T	T	F	T	T	T	F	F	F	F
T	T	T	T	T	T	F	F	T	F

$\therefore A \equiv B$

Subject:

No:

Date:

6. Assume x is odd and y is even.

Since x is odd, $x = 2h+1$ for some integer h and since y is even, $y = 2k$ for some integer k.

$$x^2 - 2y = (2h+1)^2 - 2(2k)$$

$$= 4h^2 + 4h + 1 - 4k$$

$$= 2(2h^2 + 2h - 2k) + 1$$

$$= 2r + 1, \text{ where } r = 2h^2 + 2h - 2k \text{ and } r \in \mathbb{Z}$$

$\therefore$ since $x^2 - 2y$ is in the form of $2r+1$ where r is an integer, so $x^2 - 2y$ is odd.

The statement is true and is proven.