UNIVERSITI TEKNOLOGI MALAYSIA

ASSIGNMENT 1

SECI1013

DISCRETE STRUCTURE

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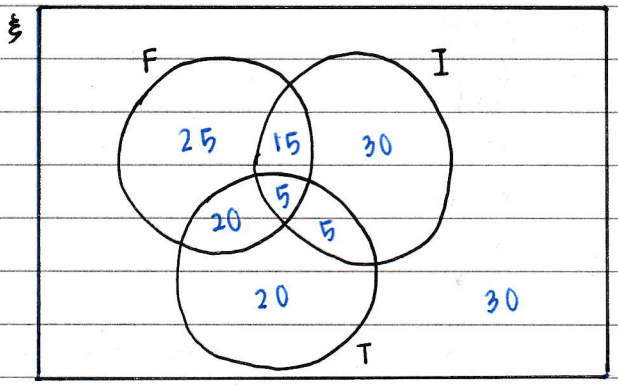
Subject: No: Date:

Assignment -1 (Chapter 1).

Question 1.

a) i) Let F - Have Facebook account
I - Have Instagram account
T - Have Twitter account



ii) $(F \cup I \cup T)' = 150 - 25 - 15 - 30 - 20 - 5 - 5 - 20$

$(F \cup I \cup T)' = 30$ students

iii) $((F \cap I) \cup (F \cap T) \cup (T \cap I)) \cap (F \cap I \cap T)' = 15 + 20 + 5$

$= 40$ students

iv) $(T \cup I) \cap F' = 30 + 5 + 20$

$= 55$ students

b) i) $A = \{3, 5, 7, 9\}$, $B = \{2, 3, 5, 7\}$, $C = \{3, 6, 9\}$

$|A| = 4$ $|B| = 4$ $|C| = 3$

ii) Proper subset of A = ϕ, $\{3\}$, $\{5\}$, $\{7\}$, $\{9\}$, $\{3, 5\}$, $\{3, 7\}$, $\{3, 9\}$, $\{5, 7\}$, $\{5, 9\}$, $\{7, 9\}$, $\{3, 5, 7\}$, $\{3, 5, 9\}$, $\{3, 7, 9\}$, $\{5, 7, 9\}$

Number of proper subsets of $A = 2^4 - 1$

$= 15$

iii) $C \times B = \{(3,2), (3,3), (3,5), (3,7), (6,2), (6,3), (6,5), (6,7), (9,2), (9,3), (9,5), (9,7)\}$

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Date: . .

Question 2

a) $\sim(p \vee q) \vee (\sim p \wedge q) \equiv \sim p$

p	q	$p \vee q$	$\sim(p \vee q)$	$\sim p$	$\sim p \wedge \sim q$	$\sim(p \vee q) \vee (\sim p \wedge q)$
T	T	T	F	F	F	F
T	F	T	F	F	F	F
F	T	T	F	T	T	T
F	F	F	T	T	F	T

$\sim(p \vee q) \vee (\sim p \wedge q)$

$= (\sim p \wedge \sim q) \vee (\sim p \wedge q)$ (De Morgan's Law)

$= \sim p \wedge (\sim q \vee q)$ (Distributive Law)

$= \sim p \wedge U$ (complement Law)

$= \sim p$ (identity Law)

b) i) $(p \rightarrow r) \wedge q$

ii) $(\sim r \vee q) \rightarrow \sim p$

iii) $\sim p \rightarrow (\sim r \vee q) \vee (r \vee \sim q)$

c) $\forall n\,(n^2 + 2n - 3 = 0)$

domain of discourse is integer

$\sim(\forall n\,(n^2 + 2n - 3 = 0))$; $\exists n \sim(n^2 + 2n - 3 = 0)$

$\sim(\forall n\,(n^2 + 2n - 3 = 0))$

= Not all integers is equal to zero

$\exists x \sim(n^2 + 2n - 3 = 0)$

= There is some integer is not equal to zero

if $n = 2$

$2^2 + 2(2) - 3 \neq 0$

∴ The statement is true

d) A : can speak Russian

B : knows C++

domain of discourse is all student at our school

i) $\exists x \, (A \wedge \neg B)$

ii) $\forall x \, (A \vee B)$

iii) $\neg \exists x \, (A \vee B)$

Question 3

Situation 1

Let a is odd, b is odd

so $a = 2k+1$, $b = 2k+1$

$$\begin{aligned} a^2 - 3b &= (2k+1)^2 - 3(2k+1) \\ &= 4k^2 + 4k + 1 - 6k - 3 \\ &= 4k^2 - 2k - 2 \\ &= 2(2k^2 - k - 1) \\ &= 2m \quad \rightarrow \text{even} \end{aligned}$$

Situation 2

Let a is odd, b is even

so $a = 2k+1$, $b = 2k$

$$\begin{aligned} a^2 - 3b &= (2k+1)^2 - 3(2k) \\ &= 4k^2 + 4k + 1 - 6k \\ &= 4k^2 - 2k + 1 \\ &= 2(2k^2 - k) + 1 \\ &= 2m + 1 \quad \rightarrow \text{odd} \end{aligned}$$

Situation 3

Let a is even, b is odd

so $a = 2k$, $b = 2k+1$

$$\begin{aligned} a^2 - 3b &= (2k)^2 - 3(2k+1) \\ &= 4k^2 - 6k - 3 \\ &= 2(2k^2 - 3k - 2) + 1 \\ &= 2m + 1 \quad \rightarrow \text{odd} \end{aligned}$$

∴ The statement is false