UNIVERSITI TEKNOLOGI MALAYSIA

Programme	SECPH - Bachelor of Computer Science (Data Engineering) with Honours
Semester	2023/24-1
Section	Section 02
Course Name	Discrete Structure
Course Code	SECI1013
Lecturer's Name	Dr. Noorfa Haszlinna Binti Mustaffa
Assignment Topic	**Assignment 1**
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44/45

No.: LIM YU HAN

DS | ASSIGNMENT 1

1. a) i. U = 150

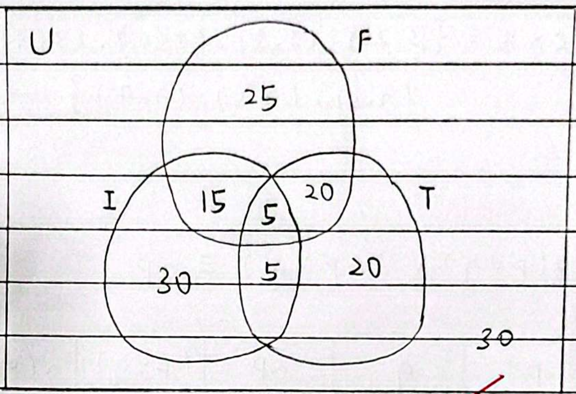
F = 25 T_o = 65

I = 30   = 55

T = 20   = 50

$F \cap I = 15$

$F \cap I \cap T = 5$



ii. do not have any acc = 150 − (40 + 25 + 30 + 25)
= 30

iii. 2 social network = 15 + 20 + 5
= 40

iv. acc other than F = 30 + 5 + 20
= 55

1. b) $A = \{ n \in N \mid n \text{ odd} , 1 < n < 10 \}$, where $N = \{\text{natural number}\}$

$B = \{ n \in N \mid n \text{ is prime} , 1 < n < 10 \}$

$C = \{ n \in N \mid n \text{ is divisible by } 3 , 1 < n < 10 \}$

i. $|A| = 4$, $\{ 3, 5, 7, 9 \}$

$|B| = 4$, $\{ 2, 3, 5, 7 \}$

$|C| = 3$, $\{ 3, 6, 9 \}$

ii. $|A| = 8$, $2^4 = 16$

$16 - 1 = 15$

iii. C×B

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

② a) $\sim(p \vee q) \vee (\sim p \wedge q) \equiv \sim p$

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

$\sim(p \vee q) \vee (\sim p \wedge q) = (\sim p \wedge \sim q) \vee (\sim p \wedge q)$ de morgan Law

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

$= \sim p \wedge U$ T complement Law

$= \sim p$

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

ii. $\neg(r \vee q) \rightarrow \neg p$

iii. $\neg p \rightarrow \neg(r \vee q)$

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c) negation of $\forall x\,(x^2 + 2x - 3 = 0)$

$\exists x\,(x^2 + 2x - 3 \neq 0)$

let x be 0, $(0)^2 + 2(0) - 3 = -3\ (\neq 0)$

∴ statement is true

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No.:

d) S(X) = student at your school

P(X) = student who can speak Russian

Q(X) = student who know C++

i) $\exists x \, (P(x) \wedge \neg Q(x))$

ii) $\forall x \, (P(x) \vee Q(x))$

iii) $\forall x \, \neg (P(x) \vee Q(x))$

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No.:

(3) prove using indirect ($\neg Q(x) \rightarrow \neg P(x)$)

" For all integers , if $a^2 - 3b$ is even then a is even and b is even "

$P(x) = a^2 - 3b$ is even

$Q(x) = a$ is even and b is even

$\neg Q(x) \rightarrow \neg P(x)$

$\neg Q(x) =$ a is odd or b is odd

true: odd odd, odd even, even odd

1

$\neg P(x) = ?$

let a be odd , b be odd (True)

$P(x) = (2k+1)^2 - 3(2k+1)$

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

$= 4k^2 - 2k - 2$

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

$= 2t$ (where $2k^2 - k - 1 = t$)

(false)

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let a be odd , b be even (True)

$P(x) = (2k+1)^2 - 3(2k)$

$= 4k^2 + 4k + 1 - 6k$

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

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

$= 2t + 1$ (where $t = 2k^2 - k$)

(true)

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let a be even , b be odd (True)

$P(x) = (2k)^2 - 3(2k+1)$

$= 4k^2 - 6k - 3$

$= 2(2k^2 - 3k) - 3$

$= 2t - 3$ (where $2k^2 - 3k = t$)

(true) ?

odd = 2t+1

$1\frac{1}{2}$.

let a be even , b be even (False)

$P(x) = (2k)^2 - 3(2k)$

$= 4k^2 - 6k$

$= 2(2k^2 - 3k)$

$= 2t$ (where $2k^2 - 3k = t$)

(false)

$\therefore$ Suppose a is odd or b is odd, $a^2 - 3b$ is odd, but when a is odd and b is odd, $a^2 - 3b$ is even, Thus, the statement is False.