UNIVERSITI TEKNOLOGI MALAYSIA

FACULTY OF COMPUTING

SECL 1013

DISCREET STRUCTURE

ASSIGNMENT 1 – CHAPTER 1

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NO.

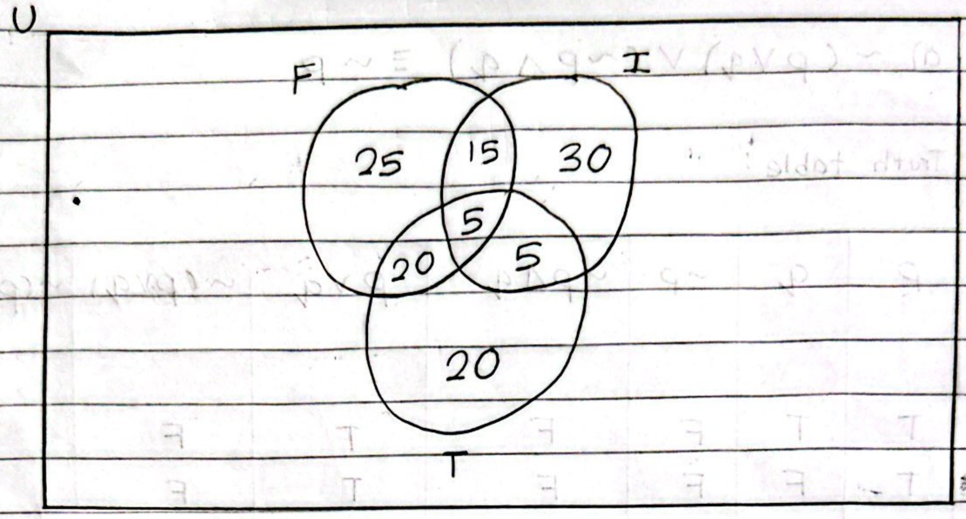
Date

Assignment 1

1) a) $U = 150$, $F = 25$ only , $I = 30$ only , $T = 20$ only

$F \cap I \cap T = 5$

i)



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

$= 30$

iii) $= 15+20+5$

$= 40$

iv) $= 30+5+20$

$= 55$

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

i) $|A| = 4$, $|B| = 3$, $|C| = 3$

ii) $|P(A)| = 2^4 - 1$

$= 15$

$P(A) = \{ \{\}, \{3\}, \{5\}, \{7\}, \{9\}, \{3,5\}, \{3,7\}, \{3,9\}, \{5,7\},$
$\{5,9\}, \{7,9\}, \{3,5,7\}, \{3,5,9\}, \{5,7,9\}\}$

iii) $C \times B$

$= \{3,6,9\} \times \{3,5,7\}$

$= \{(3,3), (3,5), (3,7), (6,3), (6,5), (6,7), (9,3), (9,5), (9,7)\}$

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

Truth table:

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

logic property law

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

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

$= \sim p \wedge (\sim q \vee q)$ Distribute law

$= \sim p \wedge U$

$= \sim p$ Identity law

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

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

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

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Date

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

$\neg(x^2+2x-3=0)$
$x^2+2x-3 \neq 0$
$(x-1)(x+3) \neq 0$

$x-1 \neq 0 \qquad x+3 \neq 0$
$x \neq 1 \qquad x \neq -3$

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

The statement is TRUE when all integers except $x=-3$ and $x=1$

d) i)
$R(x)$: Student x can speak Russian
$C(x)$: Student x know C++

i) $\exists x\ (R(x) \wedge \neg C(x))$

ii) $\forall x\ (R(x) \vee C(x))$

iii) $\neg\forall x\ (R(x) \vee C(x))$
$\exists x\ (\neg R(x) \wedge \neg C(x)) \qquad \sim(p \vee q)$

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3) indirect prove

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

Case 1

$\sim q$ = a is odd

$\sim r$ = b is odd

$\sim p$ = $a^2 - 3b$ is odd

$$a^2 - 3b = (2k+1)^2 - 3(2k+1)$$
$$= 4k^2 + 4k + 1 - 6k - 3$$
$$= 4k^2 - 2k - 2$$
$$= 2(2k^2 - k - 1)$$
$$= 2m$$

= any number times with 2 give ~~giv~~ even number

$\sim q \vee \sim r \rightarrow \sim p$

It is false

Case 2

q = a is even

$\sim r$ = b is odd

$\sim p$ = $a^2 - 3b$ is odd

$$a^2 - 3b = (2k)^2 - 3(2k+1)$$
$$= 4k^2 - 6k - 3$$
$$= 2(2k^2 - 3k) - 3$$
$$= 2m - 3$$

= it is odd

$q \vee \sim r \rightarrow \sim p$

It is true


thank you!