SCHOOL OF COMPUTING
Faculty of Engineering

SECI1013 DISCRETE STRUCTURE

Assignment 3

Lecturer Name: Dr Haswadi Bin Hasan

Section 07

Prepared by: Group 3

NAME	MATRIC NO
IBTESHAM AHMED PROMIT	A20EC4027
MOHAMED YASSER ELREFAEY	A20EC9106
LIU JIA HWEE	A20EC0069

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Subject :

Date :

Ans to the Ques. No - 1

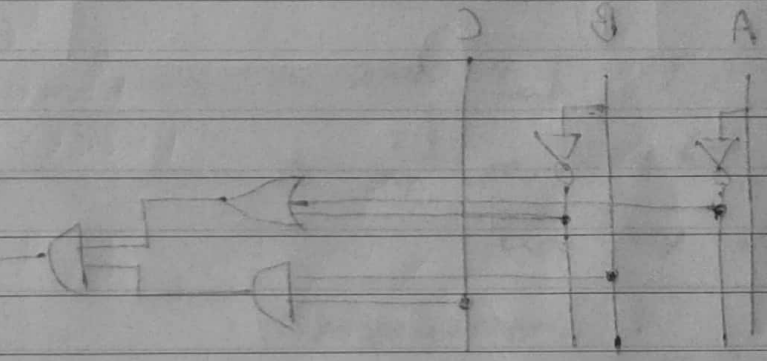
a) $A = \{1, 2, 3, 4, 5, 6, 7, 8\}$

$B = \{2, 5, 9\}$

$C = \{a, b\}$

i. $A - B$

$= \{1, 3, 4, 6, 7, 8\}$



ii. $(A \cap B) \cup C$

$= \{2, 5\} \cup C$

$= \{a, b, 2, 5\}$

iii. $A \cap B \cap C$

$= \{2, 5\}$

iv.) $B \times C$

$= \{2, 5, 9\} \times \{a, b\}$

$= \{(2, a), (2, b), (5, a), (5, b), (9, a), (9, b)\}$

v. $P(C)$

$= \{\phi, \{a\}, \{b\}, \{a, b\}\}$

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b) $(P \cap ((P' \cup Q'))) \cup (P \cap Q) = P$

L·H·S : $P \cap (P' \cup Q') \cup (P \cap Q)$ [Distributive Law

$= (P \cap P) \cup (P \cap Q') \cup (P \cap Q)$ [Idempotent Law

$= (P \cap Q)' \cup (P \cap Q)$ [Absorbtion Law

$= P \cap (Q \cup Q')$ [Complement law

$= P \cap U$ [Properties of Universal set

$= P$

$= R \cdot H \cdot S$

(showed)

c) $A = (\neg P \vee q) \leftrightarrow (q \rightarrow P)$

P	q	$\neg P$	$(\neg P \vee q)$	$(q \rightarrow P)$	$(\neg P \vee q) \leftrightarrow (q \rightarrow P)$
T	T	F	T	T	T
T	F	F	F	T	F
F	T	T	T	F	T
F	F	T	T	T	T

d) $P(x)$ = x is an odd integer

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

So, a is an odd integer.

Let,

$a = 2x + 1$

$\Rightarrow a^2 = (2x+1)^2$

$\Rightarrow a^2 = 4x^2 + 4x + 1$

$\Rightarrow a^2 = 2(x^2 + 2x) + 1$

So now, for all odd integer x the x^2 is odd

e) i. $\exists x \exists y \; P(x,y)$: True; if any $x \geq y$ or $y \leq x$

ii. $\forall x \forall y \; (P(x,y)$: False, if $x < y$ or $y > x$

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Question 2

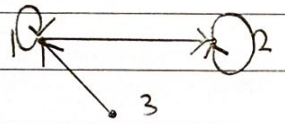
a i) $R = \{(1,1), (1,2), (2,2), (3,1)\}$

domain $= \{1, 2, 3\}$

range $= \{1, 2\}$

ii) it is not an irreflexive relation, because not all elements on its main diagonal have value 0.

it is antisymmetric because $\forall a,b \in \{1,2,3\}, (a,b) \in R \wedge a \neq b \rightarrow (b,a) \notin R$



b i) $S = \{(4,5), (5,4)\}$

ii) it is not a reflexive relation, because all elements on its main diagonal do not having value 1.

it is symmetric, because $(4,5), (5,4) \in S$

it is not a transitive relation, because $M_S \otimes M_S \neq M_S$

$$\begin{bmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 \\ 0 & 0 & 1 & 0 \end{bmatrix} \otimes \begin{bmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 \\ 0 & 0 & 1 & 0 \end{bmatrix} = \begin{bmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$$

∴ it is not equivalence, because it is not reflexive, symmetric and not transitive.

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Question 2

c i) $f: X \to Y = \{(1,1), (2,2), (3,3)\}$

ii) $f: X \to Z = \{(1,1), (1,2), (2,2), (3,1)\}$

iii) $f: X \to X = \{(1,3), (2,1), (2,3), (3,3)\}$

d i) $m(x) = 4x + 3$

$m(x) = y$

$m^{-1}(y) = x$

$y = 4x + 3$

$x = \frac{y-3}{4}$

$m^{-1}(y) = \frac{y-3}{4}$

$\therefore m^{-1}(x) = \frac{x-3}{4}$

ii) $n \circ m = n(m(x))$

$= 2(4x+3) - 4$

$= 8x + 2$

Q3

a(i)

$a_2 = a_1 + 2(2)$

$= 1 + 4 = 5$

$a_3 = a_2 + 2(3)$

$= 5 + 6 = 11$

$a_4 = a_3 + 2(4)$

$= 11 + 8 = 19$

first 3 terms : 5, 11, 19

(ii) InPut : K, integer ≥ 1

OutPut : a(K)

a(K)

if K = 1

return 1

return a(K-1) + 2K

3

(b) $a_K = 2a_{K-1}$, $K \geq 2$

$r_0 = a_1 = 7$

$r_K = 2^K r_{K-1}$, $K \geq 1$

r_{K-1}

$r_1 = 2^1 r_0$

$r_1 = 7$

$r_K = 7 \cdot 2^K$

(c) n = 1, S(1) = 5

n = 2, S(2) = 5 * 5 (1)

S(2) = 25

n = 3, S(3) = 5 * 5 (2)

S(3) = 125

n = 4, S(4) = 5 * 5 (3)

S(4) = 625

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Question 4

a) 3-B _ _ _ 5-F

0, 1, 2, 3, 4, 5, 6, 7, 8, 9, A, B, C, D, E, F

If first digit is 3 or 4, then first digit has 2 possible numbers, last digit has 11 possible numbers.

$C(2,1) \times C(11,1) \times P(14,2) = 4004$ ways

If first digit is 5 to B, then first digit has 7 possible numbers, last digit has 10 possible numbers.

$C(7,1) \times C(10,1) \times P(14,2) = 12740$ ways

∴By using addition rule,

$4004 + 12740 = 16744$ ways.

b) A _ _ _ _ _ 0

Since there are 26 alphabets and 10 numbers,

$1 \times P(26,3) \times P(10,2) \times 1$

$= 1 \times 26^3 \times 10^2 \times 1$

$= 1757600$ ways

c) 1 letter : $C(8,1) = 8$ ways

2 letters : $P(8,2) = 56$ ways

3 letters : $P(8,3) = 336$ ways.

By using addition rule,

$8 + 56 + 336 = 400$ ways

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Question 4

d) 7 women , 6 men

women : $C(7,4) = 35$

men : $C(6,3) = 20$

By using multiplication rule,

$35 \times 20 = 700$ ways

f) 6 types of pastry, then $n = 6$

selection of 10 pastries, then $r = 10$

$C(10+6-1, 10) = C(15,10)$

$= 3003$ ways.

Q5

(a) $K = 2 \times 3 = 6$ $\quad n = 18$

$n/K = \frac{18}{6} = 3$ People with same first and last name

(b) we have equal number of odd and even integers from 1 to 20, the Probability of picking odd integer is $1/2$ in every pick

Thus you have to pick 11 times to be sure that atleast 1 number is odd

(c) There are 80 integers in the range which are not divisible by 5.

So you got to pick 81 times to be sure that atleast there is 1 number divisible by 5.