

Fareeha Jehangiri

ID :: 16051

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Program :: Software Eng

Submitted to Sir Ibray

Subject :: Discrete Structure

MID TERM Exams

## Attempt All Questions

Which of the following are Propositions

- 1- Buy Premium Bonds!  
It is not Proposition.
  - 2- The Apple Macintosh is a 16 bit comp  
It is proposition.
  - 3- There is a largest even number  
It is proposition.
  - 4- Why ~~are~~ are we here?  
It is not proposition.
  - 5-  $8 + 7 = 13$   
It is Proposition  
 $a + b = 13$   
It is not proposition
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## Question 2

P is " $X \wedge 50$ "; q is " $X \wedge 40$ ";

Write as simple as you can:

- a - P
- b - q
- c  $P \wedge q$  ✓
- d  $P \vee q$
- e -  $P \vee q$
- f -  $P \wedge q$

C is the correct option

## Question 3

In each part of this question a proposition p is defined. Which of the statements that follow the definition correspond to the proposition  $\neg p$ ? (There may be more than one correct answer).

"A"

P is "Some People like Maths."

(a) "Some people dislike Maths" ✓

(b) "Some people dislike Maths"

(c) "Everybody dislikes Maths"

(d) "Every body likes Maths"

A is the correct option.

"B"

P is "The answer is either 2 or 3"

(a) "Neither 2 nor 3 is the answer"

(b) "The answer is not 2 or it is not 3" ✓

(c) "The answer is not 2 and is not 3"

B is the correct option

"C"

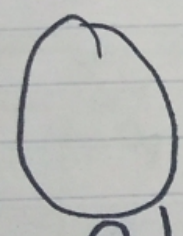
A is "All people in my class are tall and thin"

(a) "Someone in my class is short & fat"

(b) "Someone in my class is short & fat"

(c) "No-one in my class is tall and thin"

C is the correct option,



Question

4

Construct the truth tables

FOR:: ::

- a  $\neg P \vee \neg q$
- b  $q \wedge (\neg P \vee q)$
- c  $P \wedge (q \vee \neg r)$
- d  $(P \wedge q) \vee r$

# Truth Table

P	$\neg P \vee \neg Q$	$\neg P$	$\neg Q$	$\neg P \vee \neg Q$
T	T	F	F	F
T	F	F	T	T
F	T	T	F	T
F	F	T	T	T

P	Q	$\neg P$	$(\neg P \vee Q)$	$Q \wedge (\neg P \vee Q)$
T	F	F	T	T
T	F	F	F	F
F	T	T	T	T
F	T	T	T	T

$P \wedge (q \vee r)$

$P$	$q$	$r$	$(q \vee r)$	$P \wedge (q \vee r)$
T	T	T	T	T
T	F	T	T	T
T	T	F	T	T
T	F	F	F	F
F	F	T	T	F
F	T	F	T	F
F	T	T	T	F
F	F	F	F	F

$(P \wedge q) \vee r$

$P$	$q$	$r$	$(P \wedge q)$	$(P \wedge q) \vee r$
T	T	T	T	T
T	F	T	F	T
T	T	F	T	T
T	F	F	F	F
F	T	T	F	T
F	F	T	F	T
F	T	F	F	F
F	F	F	F	F

# Question 5

Use the truth tables to Show

That ..

$$\neg((p \vee \neg q) \vee (r \wedge (p \vee \neg q))) \equiv \neg p \wedge q$$

p	q	r	$\neg p$	$\neg q$	$(p \vee \neg q) \wedge (r \wedge \neg q)$	$(p \vee \neg q) \vee (r \wedge \neg q)$	$\neg((p \vee \neg q) \vee (r \wedge \neg q))$	$\neg p \wedge q$
T	T	T	F	F	T	T	F	F
T	T	F	F	F	F	T	F	F
T	F	T	F	T	T	T	F	F
T	F	F	F	T	F	T	F	F
F	T	T	T	F	T	T	T	T
F	T	F	T	F	F	T	T	T
F	F	T	T	T	T	T	F	F
F	F	F	T	T	F	T	F	F

Hence it is proved that

$$\neg((p \vee \neg q) \vee (r \wedge (p \vee \neg q))) \equiv \neg p \wedge q$$



# Question 6

Use the law of logical proposition  
to prove that

$$\underline{\underline{(Z \wedge W) \vee (-Z \wedge W) \vee (Z \wedge -W) \equiv Z \vee W}}$$

State carefully which law you  
are using at each stage

## Answer

$$\begin{aligned}
 (Z \wedge W) \vee (-Z \wedge W) \vee (Z \wedge -W) &= (Z \wedge W) \vee (Z \wedge -W) \vee (-Z \wedge W) \\
 &\quad \text{(Commutative law)} \\
 &= (Z \wedge (W \vee -W)) \vee (-Z \wedge W) \\
 &\quad \text{Distributive law} \\
 &= (Z \wedge T) \vee (-Z \wedge W) \\
 &\quad \text{Complement law} \\
 &= Z \vee (-Z \wedge W) \\
 &\quad \text{Identity law} \\
 &= (Z \vee -Z) \wedge (Z \vee W) \\
 &\quad \text{Distributive law}
 \end{aligned}$$

$$= T \wedge (Z V W)$$

Complement law

$$= (Z V W) T$$

Commutative law

$$= Z V W$$

Identity law

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