

① ID # '16236'

MID TERM ASSIGNMENT

Course title : Discrete Structure

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Program : BS (SE)
SE(A)

Q1. Which of the following are propositions?

- a) Buy Premium Bonds!
- b) The Apple Macintosh is a 16 bit Computer.
- c) There is a largest even number.
- d) Why are we here?
- e) $8 + 7 = 13$
- f) $a + b = 13$

Answer

(b) The Propositions are :-
The apple Macintosh is a 16 bit computer.

(c) There is a largest even number.
e) - $8 + 7 = 13$
f) - $a + b = 13$

(2)

Q2. P is " $x < 50$ "; q is " $x > 40$ ".

Write as simply as you can:

- (a)
- (b)
- (c)
- (d)
- (e)
- (f)

- $\neg P$
- $\neg q$
- $P \wedge q$
- $P \vee q$
- $\neg P \wedge q$
- $\neg P \wedge \neg q$

Answers.

- (a) $\neg P = x \geq 50$
- (b) $\neg q = x \leq 40$
- (c) $P \wedge q = x < 50$ and $x > 40$
- (d) $P \vee q = x < 50$ or $x > 40$
- (e) $\neg P \wedge q = x \geq 50$ and $x > 40$
- (f) $\neg P \wedge \neg q = x \geq 50$ and $x \leq 40$

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"
- (b) "Some people dislike Maths."
- (c) "Everybody dislikes Maths."

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(c) "Everybody like Maths"

b)

P is "~~Some people~~"

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 it is not 3"

c)

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

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

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

(c) "Someone in my class is short or fat"

Answer:

(a) P = "Some People like Maths"

a) $\sim P$ = "Some people dislike Maths"

(b) P = "The answer is either 2 or 3"

(a) $\sim P$ = "Neither 2 or 3 is the answer"

(4)

(A) $\sim P =$ "The answer is not 2 or it is not 3"

(B) $\sim P =$ "The answer is not 2 and it is not 3"

(C) $P =$ "All people in my class are tall and thin"

$\sim P =$ "No one in my class is tall and thin"

4- Construct truth table for

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

Answer:

Table for (A)

P	q	$\sim p \vee \sim q$
F	F	T
F	T	T
T	F	T
T	T	F

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Table for (B)

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

Table for (C)

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

Table for (D)

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

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Q5- Use truth tables to show that:

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

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

Hence proved.

(7)

ps. Use the laws of logical prepositions to prove that:

- $(Z \wedge W) \vee (\sim Z \wedge W) \vee (Z \wedge \sim W) \equiv Z \vee W$

- State carefully which law you are using at each stage.

$$(Z \wedge W) \vee (\sim Z \wedge W) \vee (Z \wedge \sim W) = (Z \wedge W) \vee (Z \wedge \sim W) \vee (\sim Z \wedge W)$$

Commutative law

$$= (Z \wedge (W \vee \sim W)) \vee (\sim Z \wedge W)$$

Distributive law

$$= (Z \wedge T) \vee (\sim Z \wedge W)$$

Complement law

$$= Z \vee (\sim Z \wedge W)$$

identity law

$$= (Z \vee \sim Z) \wedge (Z \vee W)$$

Distributive law

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

complement law

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

commutative law

$$= Z \vee W$$

identity law

Hence proved