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NAME: MUHAMMAD SAEED KHAN.
ID: 16015
SUBJECT: DISCRETE STRUCTURE.
INSTRUCTOR: SAIFULAH JAN.
DEPARTMENT: BS CS - 2.
TIMING: TUESDAY 8:00 TO 11:00.
MID-TERM EXAM.

QUESTION NO: 1

ANSWERS

PART A:

Given statements are:

p is "DATA ENDFLAG is OFF"

q is "ERROR equal 0" and

r is "SUM is less than 1,000"

It is asked to write the given statement in symbolic form using the logical operators like \wedge , \vee , \sim etc.

a) DATA ENDFLAG is OFF ERROR equal 0 and sum is less than 1,000.

$p \wedge q \wedge r$

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b) DATA ENDFLAG is off, but ERROR is not equal to 0.

$$p \wedge \sim q$$

c) DATA ENDFLAG is off, however ERROR is not zero or sum is greater than or equal to 1000.

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

d) DATA ENDFLAG is on and ERROR equal 0 but sum is greater than or equal to 1000.

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

e) Either DATA ENDFLAG is on or it is the case that both ERROR equals 0 and sum is less than 1000

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

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ANSWER NO 1

Part B:

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

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

Same truth values
and so

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

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QUESTION NUMBER 8 2.

PART A:

1) IF Howard can swim across the lake, then Howard can swim to the island.

converse: IF Howard can swim to the island then Howard can swim across the lake.

inverse:

IF Howard cannot swim across the lake, then Howard cannot swim to the island.

Contrapositive:

IF Howard cannot swim to the island then Howard cannot swim across the lake.

11) IF today is Easter, then tomorrow is Monday.

Converse:

IF tomorrow is Monday, then today is Easter.

Inverse:

IF Today is not Easter.
Then tomorrow is not Monday.

Contrapositive

IF tomorrow is
not Monday, then today is
not Easter.

ANSWER NUMBER 2

PART B:

Use truth table to determine

a) p

$p \rightarrow q$

$\sim q \vee r$

∴ r

p	q	$\sim q$	$p \rightarrow q$	$\sim q \vee r$	r	
T	T	F	T	T	T	C1
T	T	F	T	F	F	
T	F	T	F	T	T	- Invalid
T	F	T	F	T	F	argument
F	T	F	T	T	T	
F	T	F	T	F	F	
F	F	T	T	T	T	
F	F	T	T	T	F	

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b)

$$p \wedge q \rightarrow \sim x$$

$$p \vee \sim q$$

$$\sim q \rightarrow p$$

$$\text{oo } \sim x$$

Premisis

Premisis

Premisis

Conclusion

p	q	x	$\sim q$	$p \wedge q$	$p \wedge q \rightarrow \sim x$	$p \vee \sim q$	$\sim q \rightarrow p$	$\sim x$
T	T	T	F	T	F	T	T	F
T	T	F	F	T	T	T	T	T
T	F	T	T	F	T	T	T	T
T	F	F	T	F	T	T	T	T
F	T	T	F	F	T	F	T	F
F	T	F	F	F	T	F	T	T
F	F	T	T	F	T	T	F	F
F	F	F	T	F	T	T	F	T

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QUESTION NUMBER 3

ANSWERS

a: IF this house (p) is next to the lake, then the treasure is ($\sim q$) not in the kitchen.

b: IF the tree in (x) the front yard is an elm, then the treasure (q) is in the kitchen.

c: This house is next to the lake. (p)

d: The tree in (x) the front yard is an elm or the treasure is buried under the flag pole. (s)

e: IF the tree ($\sim x$) in the backyard is an oak, then the treasure is in the garage. (t)

- a) $p \rightarrow \sim q$
- b) $x \rightarrow q$
- c) p
- d) $x \vee s$
- e) $\sim x \rightarrow t$

a) $p \rightarrow \sim q$
 p From c] M.P
 $\therefore \sim q$

b) $x \rightarrow q$
 $\sim q$ From above] M.T
 $\therefore \sim x$

c) p

d) $x \vee s$
 $\sim x$ From above] D.S
 $\therefore s$

e) $\sim x \rightarrow t$
 $\sim x$ From above] M.P
 $\therefore t$

$t =$ treasure is in the garage