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Subject :- Discrete Structure

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### Question:-1

Part (a)

Let  $P$  be the statement  
- - - - -  
- - - - -  
- - - - - in symbolic notation.

a. DATAENFIAG is off, Error equal 0,  
and Sum is less than 1,000.

$P \wedge \neg X$

b. DATAENFIAG is off but Error is  
is not equal to 0.

$P \wedge \sim q$

c. DATAENDFLAG is off However, Error is not 0 or sum is greater than or equal to 1,000.

$$P \wedge \sim q \vee \sim x$$

d. DATAENDFLAG is on and Error equals 0 but sum is greater than or equal to 1,000.

$$\sim P \wedge q \vee x$$

e. Either DATAENDFLAG is on or its is the case that both Error equal 0 and sum is less than 1,000.

$$\sim P \vee (q \wedge x)$$

Part: b

Show that  $P \vee q \rightarrow x = (P \rightarrow x) \wedge (q \rightarrow x)$ .



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

Same truth values and

So

$$P \vee q \rightarrow r = (P \rightarrow r) \wedge (q \rightarrow r)$$

## Question: 2

### PART: A

Write the Converse, Inverse and Contrapositive of the following.

a. If Howard can swim across the lake, then Howard can swim to the island.

### INVERSE:-

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

### CONTRAPOSITIVE:-

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

### CONVERSE:-

When Howard can swim to the island then Howard can swim across the lake.



b. if today is Easter, tomorrow is Monday?

Converse:-

When tomorrow is Monday then today is Easter.

Inverse:-

If today is not Easter then

Contrapositive:-

when tomorrow is not Monday then today is not Easter.

Part:-b

Use truth table to determine whether the argument forms are valid. Indicate which columns represent the premises and which represent the conclusion.

$$\left. \begin{array}{l} P \\ P \rightarrow q \\ \sim q \vee r \end{array} \right\} \text{Premise}$$

$$a. \therefore r \quad \left. \vphantom{\begin{array}{l} P \\ P \rightarrow q \\ \sim q \vee r \end{array}} \right\} \text{Conclusion}$$

P	q	r	$P \rightarrow q$	$\neg q$	$\sim q \vee r$	r
T	T	T	T	F	T	T
F	T	T	T	F	T	T
T	F	T	F	T	T	T
F	F	T	T	T	T	T
T	T	F	T	F	F	F
F	T	F	T	F	F	F
T	F	F	F	T	T	F
F	F	F	T	T	T	F

$$P \wedge q \rightarrow \sim q$$

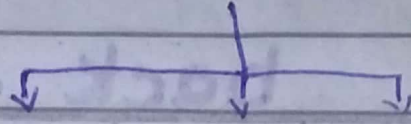
$$P \vee \sim q$$

$$\sim q \rightarrow P$$

$$b. \therefore \sim q$$



# Premises



P	q	r	$p \wedge q$	$p \wedge q \rightarrow r$	$p \vee \sim q$	$\sim q \rightarrow p$	$\sim r$	Conclusion
T	T	F	T	F	T	T	F	
T	T	F	T	T	T	T	T	
T	F	T	F	T	T	T	F	
T	F	T	F	T	T	T	T	
F	T	F	F	T	F	T	F	
F	T	F	F	T	F	T	T	
F	F	T	F	T	T	F	F	
F	F	T	F	T	T	F	T	





TE: the tree in the front yard is an elm.

$\bar{T}F$ : the treasure is buried under the flagpole.

$\bar{T}O$ : the tree in the back yard is an oak.

$\bar{T}G$ : the treasure in the garage.

**The premises are:-**

a.  $HL \rightarrow \bar{T}K$

b.  $\bar{T}E \rightarrow \bar{T}K$

c.  $HL$

d.  $\bar{T}E \vee \bar{T}F$

e.  $\bar{T}O \rightarrow \bar{T}G$

**By premises are:-**

(1)  $HL \rightarrow \bar{T}K$

$HL$

$\therefore \sim \bar{T}K$

(2)  $\bar{T}E \rightarrow \bar{T}K$

$\sim \bar{T}K$

$\therefore \bar{T}E$

(3)  $\bar{T}E \vee \bar{T}F$

$\bar{T}E$

$\therefore \bar{T}F$

(4)  $HL$

(5)  $\bar{T}O \rightarrow \bar{T}G$

$\bar{T}G$

$\therefore \sim \bar{T}O$