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Subject = Discrete Mathematics

Data = 14 / 4 / 2020

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Question # 1

(A)

Express the following sentence in symbolic notation.

P : Dataendflag is off.

Q : Error equal to 0.

Y : Sum is less than 1,000.

(a) Dataendflag is off, ERROR equal 0, and Sum is less than 1,000.

Ans $P \wedge Q \wedge Y$

(b) Dataendflag is off but ERROR is not equal to 0.

Ans $P \wedge \neg Q$

(c) Dataendflag is off; however, ERROR is not 0 or Sum is greater than or equal to 1,000.

Ans $P \wedge (\neg Q \vee \neg Y)$

(d) Dataendflag is on, and, ERROR equal 0 but Sum is greater than or equal to 1,000.

Ans $\neg P \wedge (Q \wedge \neg Y)$

(e) Either Dataendflag is on or it is the case that both error equal 0 and Sum is less than 1,000.

Ans $\neg P \vee (Q \wedge Y)$

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Question 1 (B)

Show that

$$P \vee Q \rightarrow R \equiv (P \rightarrow R) \wedge (Q \rightarrow R)$$

P	Q	R	$P \vee Q$	$P \vee Q \rightarrow R$	$P \rightarrow R$	$Q \rightarrow R$	$(P \rightarrow R) \wedge (Q \rightarrow R)$
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	F	T	F
F	T	T	T	T	T	T	T
F	T	F	T	F	T	F	F
F	F	T	F	T	T	T	T
F	F	F	F	T	T	T	T

(b)

Question 2 (A)

Write the Converse, Inverse and Contrapositive of following.

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

Converse \Rightarrow

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

Inverse \Rightarrow

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

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Contrapositive \Rightarrow

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

(b) IF today is Easter, then tomorrow is Monday.

Converse \Rightarrow

IF tomorrow is Monday, then today is Easter.

Inverse \Rightarrow

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

Contrapositive \Rightarrow

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

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Question 2 B

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

a) P

$$P \rightarrow Q$$

$$\sim Q \vee R$$

$$\therefore R$$

P	Q	R	$\sim Q$	$P \rightarrow Q$	$\sim Q \vee R$
T	T	T	F	T	T
T	T	F	F	F	F
T	F	T	T	F	T
T	F	F	T	F	T
F	T	T	F	T	T
F	T	F	F	T	F
F	F	T	T	T	T
F	F	F	T	T	T

Now this question column row 1, 5 and 6 is argument.

This is valid argument.

This row 5, 6 true premises.

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$$b) \quad p \wedge q \rightarrow \sim r$$

$$p \vee \sim q$$

$$\sim q \rightarrow p$$

$$\sim p \vee r$$

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

Now row 2, 3, and 4 is equal
is true premises.

This invalid premises.

Question 3

P: This house is next to a lake.

Q: The treasure is in the kitchen.

R: The tree in the front yard is an elm.

S: The treasure is buried under the flagpole.

T: The tree in the back yard

is an oak.

U: The treasure is in the garage.

(a) If this house is next to a lake,
then the treasure is not
in the kitchen.

(b) If the tree in the front yard is
an elm, then the treasure is
in the kitchen.

(c) This house is next to a lake.

(d) The tree in the front yard is an
elm or the treasure is buried
under the flagpole.

(e) If the tree in the back yard is
an oak, then the treasure is
in the garage.

where is treasure hidden?

(a)

(b)

(c)

(d)

(e)

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Translate the five sentences.

- (a) $P \rightarrow \sim Q$
 (b) $r \rightarrow P$
 (c) P
 (d) $r \vee S$
 (e) $t \rightarrow u$

Now we will assume that the previous five premises are true and derive a conclusion using rule of inference.

Step	Reason
$P \rightarrow \sim Q$	Premises
$r \rightarrow P$	Premises
P	Premises
$r \vee S$	Premises
$t \rightarrow u$	Premises
$\sim Q$	modus Ponens of (1) and (3)
$\sim r$	Modus Tollens of (2) and (6)
S	

Result $\Rightarrow S$

$S \Rightarrow$ The treasure is buried under the flagpole.