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~~Subject~~: Descrete Structure

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Q No 1 Part (A).

Statements.

p: "DATAENDFLAG is off."

r: "ERROR equales 0".

s: Sum is less then 1,000".

@ "DATAENDFLAG is off, ERROR equales 0 and SUM is less then 1,000".

Symbolical natation.

$(p \wedge r) \wedge s$.

⑥ "DATAENDFLAG is off, but ERROR is not equales to 0".

p: "DATAENDFLAG is off."

q: "ERROR is not equales to 0".

Symbolical natation.

$p \wedge \neg q$

(c) "DATAENDFLAG is off, however ERROR is not equales to 0 or SUM is greater then or equales to 1,000".

Solution

p: "DATAENDFLAG is off".

q: "ERROR is not equales to 0".

r: "SUM is greater then or equales to 1,000".

Symbalical notation:

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

(d) DATAENDFLAG is on and ERROR equales 0, but SUM is greater then or equales to 0.

Solution

p: "DATAENDFLAG is on".

q: "ERROR is equales 0".

r: "SUM is greater then or equales to 0".

Solution.

$(p \wedge q) \wedge r$

p
T
T
T
T
F
F
F
F

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© "Either DATAENDFLAG is on or it is the case that both ERROR equales 0 and SUM is less then 1000"

p: "DATAENDFLAG is on".

q: "ERROR is equales 0".

r: "SUM is less then 1000".

$p \rightarrow (q \wedge r)$

Q NO 1 Part (B)

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

For equalency we will draw a truth table.

Truth Table for $p \vee q \rightarrow r \equiv (p \rightarrow r) \wedge (q \rightarrow r)$.

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

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

Hence in the truth table the values of $(p \vee q) \rightarrow r$ and $(p \rightarrow r) \wedge (q \rightarrow r)$ are same so both are equivalence.

Q No2 Part (A)

Write the converse, Inverse and contrapositive of the following.

(a) If Howard can Swim across the lake then Howard is Swim to the island.

Solution

Implication ($p \rightarrow q$):

p: "Howard can Swim across the lake"

q: "Howard is Swim to the island".

(i) Converse ($q \rightarrow p$)

$q \rightarrow p$: If Howard is Swim to the island then, Howard can Swim across the lake.

(ii) Inverse ($\neg p \rightarrow \neg q$)

$\neg p \rightarrow \neg q$: "If Howard does not Swim across the lake then Howard is not Swim to the Island".

(iii) Contrapositive ($\neg q \rightarrow \neg p$)

$\neg q \rightarrow \neg p$: "If Howard is not Swim to the island then, Howard does nat Swim across the lake"

Q2 Part (B)

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

(a) Truth table.

premises ↓ conclusion ↓

p	q	r	¬q	¬q ∪ r	p → q
T	T	T	F	T	T
T	T	F	F	F	T
T	F	T	T	T	F
T	F	F	T	T	F
F	T	T	F	T	T
F	T	F	F	F	T
F	F	T	T	T	T
F	F	F	T	T	T

(b)

Q3 In the back of an old cupboard you discover a note signed by a pirate famouse for his bizarre sences of humor and love of logical puzzles.

(a) if the house is next to a lake, then the treasure is not in the kitchen

p: "The house is next to a lake.

¬ q: "The treasure is not in th kitchen"

∴ (p → ¬q) Ans

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

p: "The tree in the front yard is an elm"

q: "The treasure is in the kitchen"

$p \rightarrow q$ - Implication.

(c) This house is next to a lake.

p: "This house is next to a lake.

It is only a proposition it is not an implication not a compound proposition with conjuction or Disjunction or negation.

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

p: "The tree in the front yard is an elm"

q: "The treasure is buried under the flagpole"

$p \vee q$ - it is a compound Proposition with disjunction.

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

$p \rightarrow q$: Implication.

p: "The tree in the back yard is an oak."

q: "The treasure is in the garage."

(a) $(p \rightarrow q)$ Ans.

End