Assignment No → 2

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Assignment- II

1→ First premises → If I do all the exercises in this chapter, I will understand the material.

Second premises → If I understand the material. I will do on the exam.

Third premises → If I do well on the exam, I will pass

Conclusion → I passed the exam

The given statement is valid, as the validity of an argument refers to its structure. In the given argument the conclusion must be true if the premises are true in the given case all the premises are true thus the conclusion of the given statement is True.

2→ A) You do not drive 60 m.p.h & you will get a speeding ticket.

B) You ~~t~~ can take the flight if and only if you do not buy a ticket.

3→ $p \to q$ $\quad$ $q \to (p \to r)$

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

4→ Truth Table:

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

Since the truth value of $\sim(p \wedge q)$ & $\sim p \vee \sim q$ are same hence $\sim(p \wedge q)$ & $\sim p \vee \sim q$ are logically equivalent.

5→ p: It is 9 o' clock in India.

q: It is 10 o' clock in Sri Lanka.

Therefore, the given argument becomes

$$\begin{array}{l} p \\ \underline{p \to q} \\ \therefore q \end{array}$$

Truth Table:

p	q	$p \to q$	$p \wedge (p \to q)$	$(p \wedge (p \to q)) \to q$
T	T	T	T	T
T	F	F	F	T
F	T	T	F	T
F	F	T	F	T

Since $(p \wedge (p \to q)) \to q \equiv T$,

Therefore the given argument is valid.

6→ Truth Table

p	q	$p \to q$	$p \to q$	$(p \to q) \wedge (q \to p)$	$p \Leftrightarrow q$	$[(p \to q) \wedge (q \to p)]$
T	T	T	T	T	T	T
T	F	F	T	F	F	T
F	T	T	F	F	F	T
F	F	T	T	T	T	T

Since Last column has truth value T.

Hence, $[(p \to q) \wedge (q \to p)] \Leftrightarrow [p \Leftrightarrow q]$ is a tautology

7→ P: ~~It~~ If snows today

~~q~~ q: I will ski tomorrow

Converse → $\cancel{p \to q}$ $q \to p$: I will ski tomorrow only if it snows today

Contrapositive → $\sim q \to \sim p$: If I do not skit tomorrow then it will not have snowed today

Inverse → $\sim p \to \sim q$: If it does not snow today, then it will not ski tomorrow

8→ Demorgan's Law for propositions

$\sim(P \wedge q) = -P \vee -q$ $-(p \vee q) = -p \wedge -q$

p	q	-p	-q	$p \wedge q$	$-(p \wedge q)$	$-p \vee -q$
T	T	F	F	T	F	F
F	F	T	T	F	T	T
T	T	F	F	F	T	T
F	F	T	T	F	T	T

Consider the statement $\sim(P \wedge q)$, which can interpret as meaning that it is not the case that both P and q are true. If it is not the case that both P and q are true, then at least one of P or q is false, in which case $\sim P \vee -q$ is true. Thus $\sim(P \wedge q)$ means the same thing as $\sim P \vee -q$

Hence Proved

To prove:- $p \wedge (q \vee r) = (p \wedge q) \vee (p \wedge r)$

RHS

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

$= (p \wedge -q) \vee (p \wedge -r)$

$= p \vee (-q \wedge -r)$

$= p \wedge (q \vee r) = LHS$

Hence Proved

9→ If p then q implies
P & q
not p and not q
not p and q

Not p ~~and~~ or q implies
not p and not q
not p and q
p & q

When the two are split into their individual cases they are identical so the logical statement are equivalence.

10> A proposition is a declarative sentence that is either true or false but not both. A statement is always universally true or universally false but not both.

Truth Table

p	q	$p \Rightarrow q$
T	T	T
T	F	F
F	T	T
F	F	T

11> p: Today is Tuesday
q: It is raining
r: It is cold

i) $\sim q \Rightarrow (r \wedge p)$

It is not raining then it is cold and today is tuesday

ii) $(p \vee r) \Leftrightarrow q$

It is not the case that today is tuesday or it is cold if and only if it is raining.