Sindhuja Yerramalla

Syrrmlla@memphis.edu

U00839259.

# HW-6

**Problem 1 :-**

a)

| $P$ | $q$ | $P \leftrightarrow q$ | $\neg P$ | $\neg P \leftrightarrow q$ | $(P \leftrightarrow q) \vee (\neg P \leftrightarrow q)$ |
|---|---|---|---|---|---|
| F | F | T | T | F | T |
| F | T | F | T | T | T |
| T | F | F | F | T | T |
| T | T | T | F | F | T |

b) $((P \rightarrow q) \rightarrow r) \rightarrow S$

| $P$ | $q$ | $r$ | $S$ | $(P \rightarrow q)$ | $(P \rightarrow q) \rightarrow r$ | $((P \rightarrow q) \rightarrow r) \rightarrow S$ |
|---|---|---|---|---|---|---|
| F | F | F | F | T | F | T |
| F | F | F | T | T | F | F |
| F | F | T | F | T | T | F |
| F | F | T | T | T | T | T |
| F | T | F | F | T | F | T |
| F | T | F | T | T | F | T |
| F | T | T | F | T | T | F |
| F | T | T | T | T | T | T |
| T | F | F | F | F | T | F |
| T | F | F | T | F | T | T |
| T | F | T | F | F | T | F |
| T | F | T | T | F | T | T |
| T | T | F | F | T | F | T |
| T | T | F | T | T | F | T |
| T | T | T | F | T | T | F |
| T | T | T | T | T | T | T |

Problem 2 :

a) $[(p \to q) \wedge (q \to r)] \to (p \to r) = X$. [let]

$X \equiv \neg[(\neg p \vee q) \wedge (\neg q \vee r)] \vee (\neg p \vee r)$

$\equiv \neg(\neg p \vee q) \vee \neg(\neg q \vee r) \vee \neg p \vee r$ demorganslaw

$\equiv (\neg\neg p \wedge \neg q) \vee (\neg\neg q \wedge \neg r) \vee \neg p \vee r$ demorgans law

$\equiv \neg p \vee (\neg\neg p \wedge \neg q) \vee (\neg\neg q \wedge \neg r) \vee r$ commutative.

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

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

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

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

$\equiv \neg p \vee T \vee r \equiv T$ //

$\therefore [(p \to q) \wedge (q \to r)] \to (p \to r)$ is a. tautology.//

Problem 3 :

The given statement|Proposition states that for all values of x and y in the $\mathbb{R}$ set other than $x=0$, there exists some value z that belongs to real numbers satisfying the equation $y = xz$. and this is true because for any value of x and y $[x, y \in \mathbb{R}]$ exept for $x=0$ there be a number $z = \frac{y}{x}$ (rationalnumber) but when $\boxed{x=0, z=\frac{y}{0}}$ (not defined)

Problem 4 :-

given $C(x) \Rightarrow x$ is a comedian & $F(x) \Rightarrow x$ is funny

[domain → all people]

a) $\forall (C(x) \to F(x))$

→ If a person is a comedian then he is funny

(or)

→ If every person is a comedian then every person is funny

b) $\forall x \, (C(x) \wedge F(x))$

→ All persons are comedians and funny

(or)

→ Every person is a comedean and funny

c) $\exists x \, (C(x) \to F(x))$

→ Among all persons there exists ~~one~~ some people such that if the person is comedian then he is funny

d) $\exists x \, (C(x) \wedge F(x))$

→ Among all the people there exists some ~~persons~~ people who is a comedian and funny

Problem 5

a) $\forall n \, (n+1 > n)$ → true

b) $\exists n \, (2n = 3n)$ → true

c) $\exists n \, (n = -n)$ → true

d) $\forall n \, (3n \leq 4n)$ → false