TOPICS TO BE COVERED

01 Question

02 Discussion

Q.1 Let p(x) and q(x) denote the following open statements. **[MCQ]** (P W)

$p(x): x^2 > 0$ $P(2): 2^2 > 0 (T)$ $P(1): 1^2 > 0$

$q(x): x \text{ is odd}$ $q(2): 2 \text{ is odd}$ $q(1): 1 \text{ is odd}$

for the universe of all integers, determine the truth or falsity of each of the statement.

$\forall x (p(x) \rightarrow q(x))$ $\exists x [p(x) \rightarrow q(x)]$

$S_1: \forall x [p(x) \rightarrow q(x)]$ — false

$x = 2 \quad \begin{array}{c} T \rightarrow F \\ \boxed{P(2) \rightarrow q(2)} \end{array}$ F

$\begin{array}{c} T \rightarrow T \\ \boxed{P(1) \rightarrow q(1)} \end{array}$

$S_2: \exists x [p(x) \rightarrow q(x)]$

which of the following is true?

A. S_1 only

B. S_2 only

C. Both S_1 and S_2

D. Neither S_1 nor S_2

Q.2 Consider following two First Order Logic Statements: [MCQ] (PW)

$S_1: [\forall x(\underline{\sim P(x) \vee Q(x)})] \to [\forall x\, P(x)] \to [\forall x\, Q(x)]$ (valid)
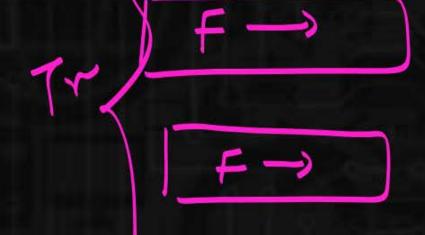
$S_2: [\exists x\, P(x)] \to [\exists x\, Q(x)] \to [\exists x\, (P(x) \to Q(x))]$ (valid)

Which of the following is valid?

A. S_1 only

B. S_2 only

C. Both S_1 and S_2 ✓

D. None of these

$T \to T$
$F \to -$

$$\overset{T}{\exists x\, P(x) \to \exists x\, Q(x) \to \exists x\, [P(x) \to q(x)]}$$

F
V
F

$\to$

Tr
$\begin{cases} F \to \\ F \to \end{cases}$

Q.3

$P(y) = \sqrt{y}$ is real in the domain of Z^+ then which of the following is / are correct?

[MSQ]

A. $\forall y \, P(y)$ ✓

B. $\exists y \, P(y)$ ✓

C. $\forall y \sim P(y)$

D. $\exists y \sim P(y)$

Q.4 Which of the following is not valid logical expression? [MCQ] (P W)

A. $\forall x \, [P(x) \rightarrow Q(x)] \rightarrow [\forall x \, P(x)] \rightarrow [\forall x \, Q(x)]$ (valid)

B. $\forall x \, [P(x) \lor Q(x)] \rightarrow [\forall x \, P(x)] \lor [\forall x \, Q(x)]$ (Invalid)

C. $\exists x \, [P(x) \land Q(x)] \rightarrow [\exists x \, P(x)] \land [\exists x \, Q(x)]$ valid.

D. $\forall x \, [P(x) \leftrightarrow Q(x)] \rightarrow [\forall x \, P(x)] \leftrightarrow [\forall x \, Q(x)]$ valid

Q.5

Consider following logical expressions:

I: $\forall y[P(y) \to Q] \leftrightarrow [\forall y\, P(y)] \to Q$ (Invalid)

II: $\exists y[P(y) \to Q] \to [\exists y\, P(y)] \to Q$ (Invalid)

which of the following logical expression is valid?

A. I only

B. II only

C. Both I and II

D. None of these ✓

$\exists y\,(P(y) \to q)$

$(P1 \to q)$
$\lor$
$(P2 \to q)$

$(P1 \to q) \lor (P2 \to q)$

$\exists y\, P(y) \to q$

$\left(\begin{array}{c} P1 \\ \lor \\ P2 \end{array}\right) \to q$

$\underline{(P1 \land P2) \to q}$