

CS & IT ENGINEERING

Mathematical Logic

DPP 08
Discussion Notes



[MSQ]

PI

P2

Q

1. I. $\{\forall [P(x) \rightarrow \{Q(x) \wedge S(x)\}], \forall x\{P(x) \wedge R(x)\}\} \rightarrow \forall x\{R(x) \rightarrow S(x)\}$ (valid)

2. II. $\{\forall x\{P(x) \vee Q(x)\}, \forall x[\{\sim P(x) \wedge Q(x)\} \rightarrow R(x)]\} \rightarrow \forall x\{\sim R(x) \rightarrow P(x)\}$

Which of the following is true?

- (a) Only argument I is valid
 - (b) Only argument II is valid
 - (c) Both arguments are valid
 - (d) Both arguments are invalid

$$\frac{\frac{P \rightarrow (Q \wedge S) \quad P \rightarrow Q \wedge S}{P \wedge R} \quad P}{R \rightarrow S} \quad \frac{P}{Q \wedge S} \quad \frac{Q \wedge S}{S} \quad \frac{S}{S \vee \neg R}$$

$$\frac{p \vee q}{\neg p \wedge q \rightarrow r} \quad \neg r \rightarrow p$$

p v q

[MSQ]

- $\frac{P_1}{1. \quad I. \quad \{\forall [P(x) \rightarrow \{Q(x) \wedge S(x)\}], \forall x\{P(x) \wedge R(x)\}\} \rightarrow \forall x\{R(x) \rightarrow S(x)\}}$ (valid)
- $\frac{P_2}{2. \quad II. \quad \{\forall x\{P(x) \vee Q(x)\}, \forall x[\{\sim P(x) \wedge Q(x)\} \rightarrow R(x)]\} \rightarrow \forall x\{\sim R(x) \rightarrow P(x)\}}$

Which of the following is true?

- (a) Only argument I is valid
- (b) Only argument II is valid
- (c) Both arguments are valid ✓
- (d) Both arguments are invalid

$$\frac{\frac{\frac{P \vee Q}{\neg(\neg P \wedge Q) \vee R}, \neg P \wedge Q \vee R}{P \vee \neg Q \vee R}}{P \vee R}$$

$$\frac{\frac{P \vee Q}{\neg P \wedge Q \rightarrow R}, \neg P \wedge Q \rightarrow R}{\neg R \rightarrow P}$$

P
W

[MSQ]

2. Which of the following is true about below predicate logic p?

$$p: \sim \forall z [p(z) \rightarrow (\sim Q(z) \rightarrow p(z))]$$

- (a) p is contradiction
- (b) p is tautology
- (c) p is satisfiable
- (d) none

$$\neg \forall z [p \rightarrow (\neg Q \rightarrow p)]$$

$$\neg p \vee (\neg Q \rightarrow p)$$

$$\neg \forall z (\neg p \vee (Q \vee p))$$

$$\begin{array}{l} \neg \forall z (Q \vee p) \\ \neg \forall z (\neg p) \end{array}$$

$$\neg \top \equiv \perp$$

[MCQ]

3. Consider the given premises:

P₁: Everyone in this discrete mathematics class has taken a course in computer science.

P₂: Madhu is a student in this class.

Which of the following is conclusion of the given premises?

- (a) Madhu has not taken a course in computer science.
- (b) Madhu has taken a course in computer science. ✓
- (c) Madhu has not studied discrete mathematics.
- (d) None of these

$$C(x) \rightarrow C \cdot S(x)$$

$$C(a)$$

$$C \cdot S(a)$$

$$D \cdot MC(x) \rightarrow CS(x)$$

$$DMC(madhu)$$

$$CS(madhu)$$



[MCQ]

4. Consider the given premises

P_1 : A student in this class has not read the book

P_2 : Everyone in this class passed the first exam.

Which of the following is conclusion of the given premises?

(a) Someone who passed the first exam has read the book.

(b) Someone who passed the first exam has not read the book.

(c) Everyone read the book.

(d) None of the above

$\neg C(a) \wedge \neg B(a)$

$\exists n(C(n) \wedge \neg B(n))$

$\forall n(C(n) \rightarrow E(n))$

$C(a) \rightarrow E(a)$ (all)

$C(a)$ (some)

$E(a)$ Some

$\neg B(a)$

Consider the following arguments

- I) All doctors are college graduates, Some doctors are not golfers Hence, some golfers are not college graduates
(Invalid)
- II) No mothers are males Some males are politicians Hence, some politicians are not mothers

Which of the following is true?

- (a) Both arguments are valid
- (b) Both arguments are invalid
- (c) Only argument I is valid
- (d) Only argument II is valid

$$\forall x D(x) \rightarrow G(x)$$

$$\frac{\exists x (D(x) \wedge \neg G(x))}{\exists x (G(x) \wedge \neg G(x))}$$

$$D(a) \rightarrow G(a) \text{ (ass)}$$

$$D(a) \wedge \neg G(a)$$

$$\frac{D(a) \rightarrow G(a)}{G(a)}$$

$$\frac{D(a) \rightarrow G(a)}{G(a) \wedge \neg G(a)}$$

Consider the following arguments

- I) All doctors are college graduates Some doctors are not golfers Hence, some golfers are not college graduates
- II) No mothers are males. Some males are politicians Hence, some politicians are not mothers

Which of the following is true?

- (a) Both arguments are valid
(b) Both arguments are invalid
(c) Only argument I is valid
(d) Only argument II is valid

$$\frac{\frac{\frac{\frac{\forall n (mT(n) \rightarrow \neg mL(n))}{\exists n (mL(n) \wedge P(n))}}{\exists n (P(n) \wedge \neg mT(n))}}{mT(n) \rightarrow \neg mL(n)}}{mL(n)}}{\neg mT(n) \wedge P(n)}$$

