

CS & IT ENGINEERING

Mathematical Logic

DPP 07
Discussion Notes



[MCQ]

1. Consider

 $\text{Actor}(x) = x \text{ is an actor}$ $\text{Smart}(x) = x \text{ is smart}$

and the well-formed formula:

 $\exists x (\text{Actor}(x) \wedge \text{Smart}(x))$

Choose the correct representation of above in english sentence.

- (a) Some Actor is smart. \checkmark (T)
- (b) Some Actor is not smart. \times
- (c) All actors are smart. \times
- (d) All smart are actors. \times

[MCQ]

Determine the truth value of each of the following statements if the universe of discourse of each variable is the set of all integers

 $\mathcal{D} : \mathbb{Z}$

S1: $\forall n \exists m (n + m = 5)$ (\top)

S2: $\exists n \forall m (nm = m)$ (\top)

S3: $\forall m \exists n (mn = 1)$ (F)

S4: $\exists m \forall n (m + n = 0)$
 $\quad \quad \quad \forall m \exists n$
 $\quad \quad \quad (F) \quad \frac{m}{2} \quad ?$

(a) S1 and S3 are true

(b) S2 and S4 is true

(c) S3 and S4 are true

(d) S1 and S2 are true ✓

$$\forall n \exists m (n + m = 5)$$

$$\begin{array}{ccc} n & m & m = 5 - n \\ 1 & 4 & = 5 - \boxed{1} \\ 2 & 3 & = 5 - \boxed{2} \\ 3 & 2 & = 5 - \boxed{3} \\ 4 & 1 & = 5 - \boxed{4} \end{array}$$

$$\exists m \forall n (m + n = 0)$$

$$\begin{array}{ccc} m & n \\ \swarrow & \searrow \end{array}$$

$$S_2: \exists n \forall m (n \cdot m = m)$$

$$\begin{array}{c} \textcircled{1} \\ 100 \\ 200 \\ = \\ \boxed{100} \end{array}$$

[NAT]

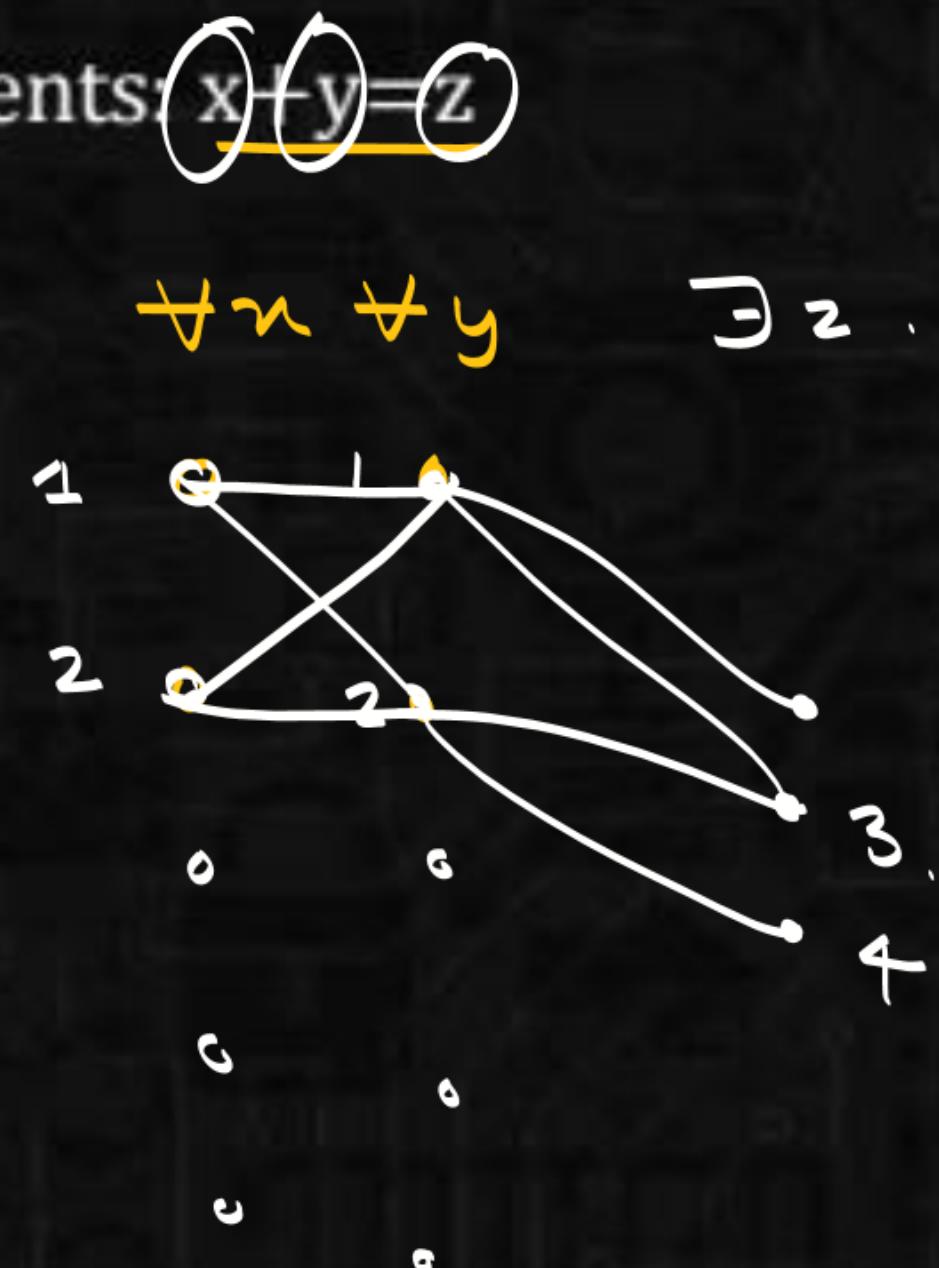
3. Consider the following statements: $x+y=z$

$$S1: \forall x \forall y \exists z Q(x,y,z) (\top)$$

$$S2: \exists z \forall x \forall y Q(x,y,z) (\text{f})$$

Which of the following is true?

- (a) Only S1 ✓
- (b) Only S2
- (c) Both S1 and S2
- (d) Neither S1 nor S2



$$x=1 \quad y=1$$

$$x+y=2$$

$$1+1=2$$

$$2=2$$

P
W

[MCQ]

4. Choose the correct representation for the below statement:

· Every player is liked by some coach"

Which of the following can be concluded?

- ~~(a) $\forall \underline{(x)} [\text{player}(x) \rightarrow \exists y [\text{coach}(y) \wedge \underline{\text{likes}}(y, x)]]$~~
- (b) $\forall \underline{(x)} [\text{player}(x) \rightarrow \exists y [\text{coach}(y) \rightarrow \text{likes}(y, x)]]$
- ~~(c) $\exists (x) [\text{player}(x) \rightarrow \forall y [\text{coach}(y) \rightarrow \text{likes}(y, x)]]$~~
- ~~(d) $\exists (x) [\text{player}(x) \rightarrow \forall y [\text{coach}(y) \wedge \text{likes}(y, x)]]$~~

