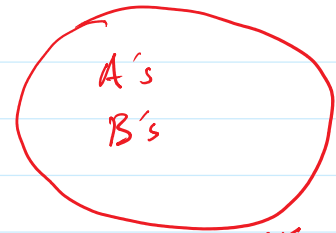


lec 12:-

A always speak lies.  
B " " " truth.



X, Y

X Says "the two of us are both B's".  $\neg p \wedge \neg q$   
Y Says "X is Kuar." P.

$p$  X is A.  $\neg p$  X is B.  
 $q$  Y is A  $\neg q$  Y is B.

A, A  
A, B  
B, A  
B, B.

①  $\neg p \wedge \neg q = F$   
 $p = T$   $\neg p = F$   
 $q = T$   $\neg q = F$ .

①  $\Rightarrow F \wedge F = F$  ✓.  
T  $\neq$  F X does not hold.

A, B  
 $\neg p \wedge \neg q = F$   
 $p = T$   $\neg p = F$   
 $q = F$   $\neg q = T$

B, A  
 $\neg p \wedge \neg q = T$   
 $p = F$   $\neg p = T$   
 $q = T$   $\neg q = F$

B, B  
 $p = T$   $\neg p = F$   
 $q = F$   $\neg q = T$

Session 1:-

Question 1

M:- P C1:- P ✓

Question 1

$$P1: P$$

$$P2: P \rightarrow Q$$

$$P3: Q \rightarrow \neg R$$

$$C: \therefore \neg R$$

$$C1: P \quad \checkmark$$

$$C2: \neg P \vee Q \quad \checkmark$$

$$C3: \neg Q \vee \neg R$$

$$C4: R$$

$$C5: Q \quad C1, C2$$

$$C6: \neg R \quad C3, C5$$

$$C7: \square \quad C6, C4.$$

Question 2:-

$$a) \forall x \forall y (P(x, y) \rightarrow \neg Q(x, y)).$$

$$\neg \forall x \forall y (P(x, y) \rightarrow \neg Q(x, y)).$$

$$= \exists x \exists y \neg (P(x, y) \rightarrow \neg Q(x, y)).$$

$$= \exists x \exists y \neg (P(x, y) \vee \neg Q(x, y)).$$

$$= \exists x \exists y P(x, y) \wedge Q(x, y).$$

$$P \rightarrow Q.$$

$$\neg P \vee Q.$$

$$b) \exists x \forall y (P(x, y) \vee \neg Q(x, y)).$$

$$\neg \exists x \forall y (P(x, y) \vee \neg Q(x, y)).$$

$$= \forall x \exists y \neg (P(x, y) \vee \neg Q(x, y)).$$

$$= \forall x \exists y \neg P(x, y) \wedge Q(x, y).$$

Question 3:-

$$\neg \forall x \neg \forall y P(x, y)$$

$$\exists x \neg \neg \forall y P(x, y)$$

$$\exists x \forall y P(x, y).$$

$$x, y \in \{1, 2\}.$$

$$\exists x (P(x, 1) \wedge P(x, 2)). = \exists x P(x, 1) \wedge \exists x P(x, 2)$$

$$(P(1, 1) \vee P(2, 1)) \wedge (P(1, 2) \vee P(2, 2)).$$

Question:- if  $\underbrace{2+3=8}_P$  then I will not teach DS  
 $q$

$P \rightarrow \neg q$ . Contrapositive.  
 $\neg(\neg q) \rightarrow \neg P$ . Original.  
 $q \rightarrow \neg P$ . = if I will teach DS then  $2+3 \neq 8$ .

a) Converse:-  $\neg P \rightarrow q$ .  
if  $2+3 \neq 8$  then I will teach DS.

b) Contra:-  $\neg(\neg P) \rightarrow \neg q$  =  $P \rightarrow \neg q$ .  
if  $2+3=8$  then I will not teach DS.

c) Inverse:-  $\neg q \rightarrow \neg(\neg P)$ . =  $\neg q \rightarrow P$ .  
if I will not teach then  $2+3=8$ .

