

8/11  
Saturday

# 2020BTECS00087 Assignment No. 5 - Omkar Ashok Ugale

a) i) If David comes to party then Bruno & Carlo come too.  
 $\Rightarrow A \rightarrow B \wedge C$

ii) Carlo comes to party only if Angela & Bruno do not come.  
 $\Rightarrow A \rightarrow \sim B \wedge \sim C$

iii) If David comes to party then if Carlo doesn't come then Angela comes.  
 $\Rightarrow A \rightarrow (\sim B \rightarrow C)$   ~~$A \leftrightarrow (B \wedge \sim C)$~~   $A \rightarrow (\sim B \rightarrow C)$

iv) If David comes to party if Carlo comes & Angela doesn't come.  
 $\Rightarrow A \leftrightarrow (B \wedge \sim C)$

v) Carlo comes to party provided that David doesn't come but if David comes then Bruno doesn't come.  
 $\Rightarrow (\sim D \rightarrow C) \wedge (D \rightarrow \sim B)$

vi) A necessary condition for Angela coming to party is that if Bruno & Carlo aren't coming, David comes.

$\Rightarrow A \rightarrow ((\sim B \wedge \sim C) \rightarrow D)$

vii) Angela, Bruno, Carlo come to party if David doesn't come but if neither Angela nor Bruno come, then David comes only if Carlo comes.

$\Rightarrow (C \wedge B \wedge A \leftrightarrow \sim D) \wedge ((\sim A \wedge \sim B) \rightarrow (D \leftrightarrow C))$

b) i)  $A =$  Carlo won match

$B =$  Mario came second

$C =$  Sergio came third



$$A \rightarrow B \vee C$$

If  $\sim B$  &  $\sim C$  then  $A = \text{False}$  i.e. A does not win competition.

Hence, statement is true.

$$ii) A \rightarrow B \vee C$$

$\Rightarrow$  If Mario doesn't come second then  $B = \text{False}$

If Sergio doesn't come second then  $C = \text{False}$

So  $A = \text{False}$  But

Carlo won the competition so  $A = \text{True}$

Statement is incorrect.

$$iii) A \rightarrow B \wedge C$$

$\Rightarrow$  If Mario didn't come second then  $B = \text{False}$

then  $A = \text{False}$

i.e. Carlo didn't win competition so statement is correct.

c) i) Bill has at least one sister

$$\Rightarrow \exists x \text{ sister}(x) \rightarrow \text{Bill}(x, \text{sister})$$

ii) Bill has no sister

$$\Rightarrow \forall x \text{ sister}(x) \rightarrow \sim \text{Bill}(x, \text{sister})$$

iii) Bill has at most one sister

$$\Rightarrow \forall (x) [\text{sister}(x) \rightarrow \sim \text{Bill}(x, \text{sister})] \vee \exists (x) [\text{sister}(x) \rightarrow \text{Bill}(x, \text{sister})] \wedge \forall (y) [\sim (x=y) \wedge \text{sister}(y) \rightarrow \sim \text{Bill}(y, \text{sister})]$$

iv) Bill has exactly one sister

$$\Rightarrow \exists (x) [\text{sister}(x) \rightarrow \text{Bill}(x, \text{sister})] \wedge \forall (y) [\sim (x=y) \wedge \text{sister}(y) \rightarrow \sim \text{Bill}(y, \text{sister})]$$

v) Bill has at least two sisters

$$\Rightarrow \exists (x) [\text{sister}(x) \rightarrow \text{Bill}(x, \text{sister})] \wedge \exists (y) [\sim (x=y) \wedge \text{sister}(y) \rightarrow \text{Bill}(y, \text{sister})]$$

vi) Every student takes at least one course

$$\Rightarrow \forall (x) [\text{student}(x) \rightarrow \exists (y) [\text{course}(y) \wedge \text{Takes}(x, y)]]$$



1) If Mary has runny nose she has cold. If she has cold then she has contagious disease.

If Mary has red-spots & fever she has measles then she has contagious disease.

2) If John has stiff neck & fever then he has meningitis. If he has meningitis it is contagious & dangerous. Then John should be isolated.

Q.3 a) ( Ram

( Profession (value Doctor) )

( Age (value 40) )

( Wife (value Sita) )

( Children (value Babu, Gita) )

( Address

( Street (value 100 kps) )

( City (value Delhi) )

( Country (value India) )

( Zip (value 756005) )

)

)

b) ( Akash

( Car (value Maruti) )

( Colour (value white) )

( Model (value EX-400) )

( Doors (value 5) )

( Weight (value 225 kg) )

( Capacity (value 8) )

( Mileage (value 15 km/lit) )

)



vii) Only one student Failed Geometry

$$\Rightarrow \neg \exists (x) [Student(x) \wedge Failed(x, Geometry) \wedge \forall y (Student(y) \wedge Failed(y, Geometry) \rightarrow x = y)]$$

viii) No student Failed Geometry but at least one student failed Analysis.

$$\Rightarrow \neg \exists (x) [Student(x) \wedge Failed(x, Geometry)] \wedge \exists (x) [Student(x) \wedge Failed(x, Analysis)]$$

ix) Every student who takes Analysis also takes Geometry.

$$\Rightarrow \forall (x) [Student(x) \wedge Takes(x, Analysis) \rightarrow Takes(x, Geometry)]$$

Q.2 i) Tom is a cat

ii) Tom is owned by John

iii) Tom is coloured ginger.

iv) Tom caught bird

v) Cat sat on mat.

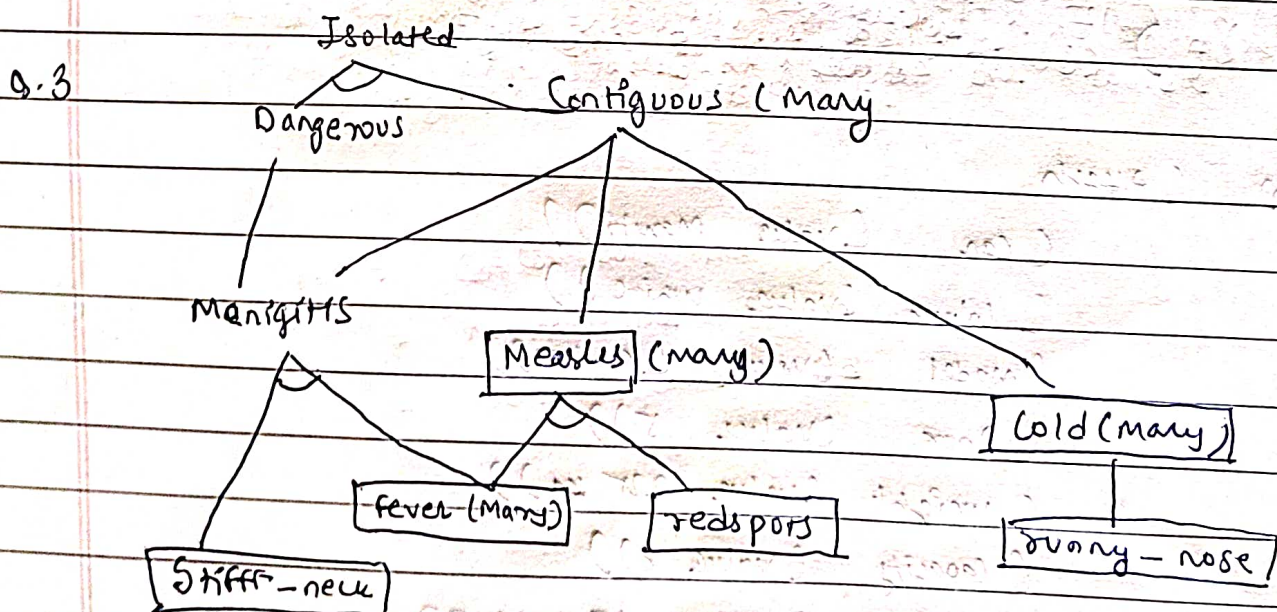
vi) Cat is a mammal

vii) Cat like cream.

viii) Bird is a animal

ix) Mammal has fur

x) Mammal is a animal



$\therefore$  Mary has continuous disease & John should be isolated.