Elham Mohammadi 50739 04

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1, propositional logic 50739 04

solution:

A → carla goes C → Mario goes

B → Diana goes D → Bruno goes

converting into formules:

1) $D \rightarrow \sim A \rightarrow \psi_1$

2) $(D \vee C) \vee (D \wedge C) \rightarrow \psi_2$

3) $C \rightarrow B \rightarrow \psi_3$

4) $A \rightarrow \sim B \rightarrow \psi_4$

5) $(A \vee B) \wedge (C \vee D)$ The party is over at least one female & male are going $\rightarrow \varphi$

The ψ_1, ψ_2, ψ_3 and ψ_4 are because if they are not the every formula it is a logical consequence of them.

There are total 5 constraints ($\psi_1, \psi_2, \psi_3, \psi_4, \varphi$)

The party will be there only if it is satisfiable i.e there is at least one interpretation that can satisfy all the constraints ($\psi_1 \wedge \psi_2 \wedge \psi_3 \wedge \psi_4 \wedge \psi_5$ is T).

$(A \vee B) \vee (C \vee D) \Rightarrow$ 9) A B
10) C D

considering the above constraint is we consider the following interpretation i.e. A^i, F, B^i, T, C^i, T and D^i, T

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then the given logic is true

$\Psi_1 \wedge \Psi_2 \wedge \Psi_3 \wedge \Psi_4 \wedge \Psi_5 \rightarrow T$ and is satisfiable Hence the party will be there.

only if carla does not go to the party

$\Psi_1 : D \rightarrow \sim A \equiv (\sim D \vee \sim A)$

$\Psi_2 : (D \vee C) \vee (D \wedge C)$

$\Psi_3 : C \rightarrow B \equiv \sim C \vee B$

$\Psi_4 : A \rightarrow \sim B \equiv \sim A \vee \sim B$

$\Psi_1, \Psi_2, \Psi_3, \Psi_4$ are

1) $\sim D$, $\sim A$ } Ψ_1 3) D, C } Ψ_2 5) $\sim C$ } Ψ_3
4) D, C 6) B

7) $\sim A$, 8) $\sim B$ } Ψ_4

To find whether the party will happen or not the Ψ_1, Ψ_2, Ψ_3 and Ψ_4 would satisfy φ where φ is $(A \vee B) \wedge (D \vee C)$ which means the party is over when one male & female not going.

satisfiable Hence the party will be there.

5, Rational logic

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

The above statement is satisfiable if there exists at least one interpretation that is T.

every individual is a 'p' then there must exist at least one individual which is 'p'.

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we can not build a Model that doesn't satisfy the statement, so the statement is satisfied.

$\forall x . \exists y . Q(x,y) \rightarrow \exists x . \forall y \, Q(x.y)$

2) $\forall x . \exists y . \varphi(x,y) \rightarrow \exists x . \forall y \, \varphi(x.y)$

$\forall x . \forall y$

$\exists y , \exists x \rightarrow$ satisfied

3) $\exists y . p(y) \rightarrow \forall x . p(x)$

$\exists y , \forall x \rightsquigarrow$ possible

4) $\forall x \forall y . Q(x,y) \rightarrow \exists x . p(x)$ not possible

5) $\forall x \, p(x) \rightarrow \exists y \, Q(x,y) \wedge \exists z . p(z) \rightarrow \exists x \, \exists y \, Q(x,y)$

not possible