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AI - Exam :-

Nagalakunta Sumanth.
S 5065491.

Exercise 1 :-

$A \rightarrow$ ~~at~~ Carla goes to party

$B \rightarrow$ Diana goes to the party

$C \rightarrow$ Mario goes to the party

$D \rightarrow$ Bruno goes to the party.

Formalize the given sentence.

i) $D \rightarrow \neg A \longrightarrow \varphi_1$

ii) $(D \vee C) \vee (D \wedge C) \longrightarrow \varphi_2$

iii) $C \rightarrow B \rightarrow \varphi_3$

iv) $A \rightarrow \neg B \longrightarrow \varphi_4$

v) $(A \vee B) \wedge (C \vee D)$ The party is over atleast one female and male are going $\rightarrow \phi$

Lets try resolution for above equation:

$\varphi : D \rightarrow \neg A \equiv (\neg D \vee \neg A)$

$\varphi_2 : (D \vee C) \vee (D \wedge C)$

$\varphi_3 : C \rightarrow B \equiv (\neg C \vee B)$

$\varphi_4 : A \rightarrow \neg B \equiv (\neg A \vee \neg B)$

closes of ψ_1 ψ_2 ψ_3 ψ_4 are

i) $\neg D$
ii) $\neg A$ } ψ_1

iii) D, C
iv) D, C } ψ_2

v) $\neg C$
vi) B } ψ_3

vii) $\neg A$
viii) $\neg B$ } ψ_4

To find whether the party will happen (or) not. The $\psi_1, \psi_2, \psi_3, \psi_4$ would satisfy ϕ. where ϕ is $(A \vee B) \wedge (D \vee C)$.

which means the party is over when one male and female frd are going.

The ψ_1, ψ_2, ψ_3 and ψ_4 are consident because if they are not the every female bn) is a logical consequence of them.

there are total 5 constrains (ψ_1 ψ_2 ψ_3 ψ_4 and ϕ)

The party will be there only if i.e. it is satisfice. i.e. There is atleast one interpretation. total can satisfy all the constraint ($\psi_1 \wedge \psi_2 \wedge \psi_3 \wedge \psi_4 \wedge \phi$ is True).

$(A \cup B) \vee (C \vee D) \Rightarrow$ ix) A B
x) C D } considering the above statements constraints

is we consider the following i.e $A' = F$ $B' = T$ $C' = T$ and $D' = T$. Then the given logic is True.

so if satisfiable (i.e) for the above interation

$\psi_1 \wedge \psi_2 \wedge \psi_3 \wedge \psi_4 \wedge \psi_5 \rightarrow T$ and is satisfiable.

Hence the party will be there.

only is caily does not goes to the party.

Exercise 5:-

1. $\forall x. P(x) \rightarrow \exists y. P(y) \Rightarrow \neg \forall x. P(x) \vee \exists y. P(y) \Rightarrow \exists x. P(x) \vee \exists y. P(y)$

$\exists x. \exists y (\neg P(x) \vee P(y)) \rightarrow$ always satisfied in all possible interpretation of P.

$\exists x$

$\neg P(a) \vee P(a)$ — If $P(a)^i = T$ ok!

$\neg P(a) \vee P(b)$ — if $P(a)^i = F$ also ok!

$\neg P(b) \vee P(a)$ — If $P(b)^i = T$ ok!

$\neg P(b) \vee P(b)$ — If $P(b)^i = T$ ok!

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

$Q(a,y) < \begin{matrix} Q(a,a) \\ Q(a,b) \end{matrix}$ antecedent part $\qquad Q(a,y) < \begin{matrix} Q(a,a) \\ Q(a,b) \end{matrix}$

$Q(b,y) < \begin{matrix} Q(b,a) \\ Q(b,b) \end{matrix} \qquad Q(b,y) < \begin{matrix} Q(b,a) \\ Q(b,b) \end{matrix}$

If $Q(a,b)^i = T$ and $Q(b,a)^i = T$ then the antecedent is true, but the consequent is false, so it isn't always satisfied.

3. $\exists y. P(y) \rightarrow \forall x. P(x) \Rightarrow \neg \exists y. P(y) \vee \forall x. P(x) \Rightarrow \forall y. \neg P(y) \vee \forall x. P(x)$

$\forall x. \forall y (\neg P(y) \vee P(x))$

i) $\neg P(a) \vee P(a)$ — if $P(a)^i = T$ i) ok!

ii) $\neg P(a) \vee P(b)$ — ii) ok!

iii) $\neg P(b) \vee P(a)$ — iii) ok! but also $P(b)^i = T$

iv) $\neg P(b) \vee P(b)$ — iv) ok!

So if $P(a)^i = T$ and $P(b)^i = F$ the formula isn't satisfied. so not all interpretations are allowed.

iv) $\forall x \forall y. \ \varphi(x, y) \Rightarrow \exists x . P(x)$

$$\Downarrow$$

its not possible.

v) $(\forall x \ P(x) \rightarrow \exists y \varphi(x, y) \wedge \exists z . P(y)) - \exists x \exists y . \bar{\varphi}(x . y)$

$$\Downarrow$$

It not possible.