Assignment - 1

M.k Gagan Roshan
1BM18CS049
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① FOL into CNF

$$\forall x [\exists z \text{ Animal}(z) \wedge \text{Kills}(x,z)] \Rightarrow [\forall y \rightarrow \text{Loves}(y,x)]$$

$$\forall x [\neg \exists z \{\text{Animal}(z) \wedge \text{kills}(x,z)\}] \vee [\forall y \rightarrow \text{loves}(y,x)]$$

$$\forall x [\neg \exists z \neg \text{Animal}(z) \vee \neg \text{kills}(x,z)] \vee [\forall y \rightarrow \text{loves}(y,z)]$$

$$\forall x [\forall z \rightarrow \text{Animal}(z) \vee \neg \text{kills}(x,z)] \vee [\forall y \rightarrow \text{loves}(y,z)]$$

$$\forall x \forall y \forall z [\rightarrow \text{Animal}(z) \vee \neg \text{kills}(x,z)] \vee [\rightarrow \text{loves}(y,z)]$$

$$\forall x [\rightarrow \text{Animal}(G(x)) \vee \neg \text{kills}(x, G(x))] \vee [\rightarrow \text{loves}(F(x), x)]$$

$$[\rightarrow \text{Animal}(G(x)) \vee \neg \text{loves}(F(x), x)] \vee [\rightarrow \text{kills}(x, g(x)) \vee \rightarrow \text{loves}(F(x), x)]$$

$$[\rightarrow \text{Animal}(G(x)) \vee \neg \text{loves}(F(x), x)] \vee [\rightarrow \text{kills}(x, g(x)) \vee \rightarrow \text{loves}(F(x), x)]$$

② Convert the sentences into FOL & prove using resolution

(i) Cold and precipitation → Snow

$$\text{Cold}(x) \wedge \text{precipitation}(x) \Rightarrow \text{Snow}(x)$$

$$\neg(\text{Cold}(x) \wedge \text{precipitation}(x)) \vee \text{Snow}(x)$$

$$\neg \text{Cold}(x) \vee \neg \text{precipitation}(x) \vee \text{Snow}(x)$$

(ii) January → cold

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$\text{January}(x) \Rightarrow \text{cold}$ $\quad \neg \text{January}(x) \vee \text{cold}(x)$

(iii) clouds → precipitation

$\text{clouds}(x) \Rightarrow \text{precipitation}(x)$ $\quad \neg \text{clouds}(x) \vee \text{precipitation}(x)$

(iv) January(x) $\quad$ (v) clouds(z)

To prove : Snow(x)

→ Resolution of (i) and (ii)

(vi) $\neg$ Precipitation(x) $\vee$ Snow(x) $\vee \neg$ January(x)

→ Resolution of (vi) & (iv)

(vii) $\neg$ Precipitation(x) $\vee$ Snow(x)

→ Resolution of (viii) and (ii)

(viii) Snow(x) $\vee \neg$ clouds(x)

→ Resolution of (viii) and (v)

Snow(x)

Hence proved.

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