AI assignment - 1

① Convert the following FOL into CNF

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

i) Eliminate implication :- $A \Rightarrow B \equiv \neg A \vee B$

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

ii) Move $\neg$ Inwards :- $\neg \exists x\, p \equiv \forall x \neg p$

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

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

iii) Drop universal quantifiers.

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

iv) CNF :-

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

② Convert the sentences into FOL & prove using resolution.

Rules & facts:

① Cold & precipitation → snow

$cold(x) \wedge precipitation(x) \Rightarrow snow(x)$

$\neg cold(x) \wedge precipitation(x) \vee snow(x)$

$\neg cold(x) \vee \neg precipitation(x) \vee snow(x)$

(ii) January → cold

$January(x) \Rightarrow cold(x)$

$\neg January(x) \vee cold(x)$

(iii) clouds → precipitation

$clouds(x) \Rightarrow precipitation(x)$

$\neg clouds(x) \vee precipitation(x)$

(iv) $January(x)$

(v) $clouds(x)$

To prove: $snow(x)$

→ Resolution of (i) & (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 (vii) & (iii)

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

→ Resolution of (viii) & (v)

$snow(x)$

Hence proved.