

CSED342 Assignment 8

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Problem 2a

$$KB = \{(A \wedge B) \rightarrow \neg C, \neg(\neg A \vee C) \rightarrow D, A\}$$

(i) First, let's convert this KB into CNF forms.

$$\begin{aligned}(A \wedge B) \rightarrow \neg C &\Rightarrow \neg(A \vee B) \vee \neg C \\ &\Rightarrow (\neg A \wedge \neg B) \vee \neg C \\ &\Rightarrow (\neg A \vee \neg C) \wedge (\neg B \vee \neg C) \\ &\Rightarrow \neg A \vee \neg C, \quad \neg B \vee \neg C\end{aligned}$$

$$\neg(\neg A \vee C) \rightarrow D \Rightarrow \neg A \vee C \vee D$$

$$KB = \{\neg A \vee \neg C, \neg B \vee \neg C, \neg A \vee C \vee D, A\}$$

(ii) Secondly, let's apply Modus Ponens inference rule.

$$\begin{aligned}\frac{A, \neg A \vee \neg C}{\neg C} &\Rightarrow KB = \{\neg A \vee \neg C, \neg B \vee \neg C, \neg A \vee C \vee D, A, \neg C\} \\ \frac{A, \neg A \vee C \vee D}{C \vee D} &\Rightarrow KB = \{\neg A \vee \neg C, \neg B \vee \neg C, \neg A \vee C \vee D, A, \neg C, C \vee D\} \\ \frac{\neg C, C \vee D}{D} &\Rightarrow KB = \{\neg A \vee \neg C, \neg B \vee \neg C, \neg A \vee C \vee D, A, \neg C, C \vee D, D\}\end{aligned}$$

Finally, we derived D.

Problem 2b

$$KB = \{A \vee B, B \rightarrow C, (A \vee C) \rightarrow D\}$$

(i) First, let's convert this KB into CNF forms.

$$B \rightarrow C \Rightarrow \neg B \vee C$$

$$\begin{aligned} (A \vee C) \rightarrow D &\Rightarrow \neg(A \vee C) \vee D \\ &\Rightarrow (\neg A \wedge \neg C) \vee D \\ &\Rightarrow (\neg A \vee D) \wedge (\neg C \vee D) \\ &\Rightarrow \neg A \vee D, \neg C \vee D \end{aligned}$$

$$KB = \{A \vee B, \neg B \vee C, \neg A \vee D, \neg C \vee D\}$$

(ii) Secondly, let's apply Resolution inference rule.

$$\begin{aligned} \frac{A \vee B, \neg B \vee C}{A \vee C} &\Rightarrow KB = \{A \vee B, \neg B \vee C, \neg A \vee D, \neg C \vee D, A \vee C\} \\ \frac{A \vee C, \neg C \vee D}{A \vee D} &\Rightarrow KB = \{A \vee B, \neg B \vee C, \neg A \vee D, \neg C \vee D, A \vee C, A \vee D\} \\ \frac{D \vee \neg A, A \vee D}{D \vee D} &\Rightarrow KB = \{A \vee B, \neg B \vee C, \neg A \vee D, \neg C \vee D, A \vee C, A \vee D, D\} \\ &(\because D \vee D \Rightarrow D) \end{aligned}$$

Finally, we derived D.