Artificial Intelligence – Spring 2021

Homework 3

Issued: March 29th, 2021   Due: April 12th, 2021

Problem 1:

6.5 Solve the cryptarithmetic problem in Figure 6.2 by hand, using the strategy of back-tracking with forward checking and the MRV and least-constraining-value heuristics.
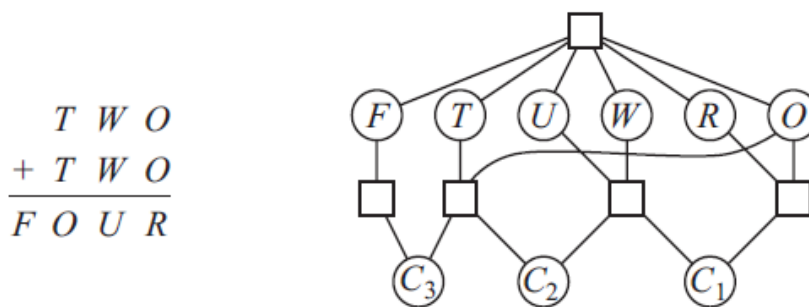

Figure 6.2

Problem 2:

6.11 Use the AC-3 algorithm to show that arc consistency can detect the inconsistency of the partial assignment $\{WA = green, V = red\}$ for the problem shown in Figure 6.1.

Figure 6.1
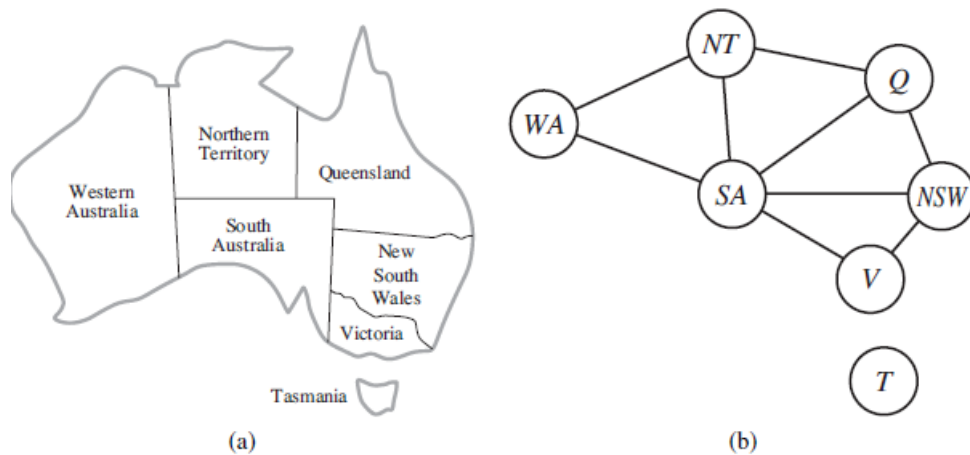
Problem 3:

7.4 Which of the following are correct?

    a. $\textit{False} \models \textit{True}$.

    b. $\textit{True} \models \textit{False}$.

    c. $(A \wedge B) \models (A \Leftrightarrow B)$.

    d. $A \Leftrightarrow B \models A \vee B$.

    e. $A \Leftrightarrow B \models \neg A \vee B$.

    f. $(A \wedge B) \Rightarrow C \models (A \Rightarrow C) \vee (B \Rightarrow C)$.

    g. $(C \vee (\neg A \wedge \neg B)) \equiv ((A \Rightarrow C) \wedge (B \Rightarrow C))$.

Problem 4:

7.18 Consider the following sentence:

$$[(\textit{Food} \Rightarrow \textit{Party}) \vee (\textit{Drinks} \Rightarrow \textit{Party})] \Rightarrow [(\textit{Food} \wedge \textit{Drinks}) \Rightarrow \textit{Party}].$$

    a. Determine, using enumeration, whether this sentence is valid, satisfiable (but not valid), or unsatisfiable.

    b. Convert the left-hand and right-hand sides of the main implication into CNF, showing each step, and explain how the results confirm your answer to (a).

    c. Prove your answer to (a) using resolution.