CECS 451
Assignment 4
Total: 22 Points

General Instruction

- I recommend you can write your answer using LaTeX.
- Submit a PDF file in the Dropbox folder via BeachBoard (Not email).
- Simple reasoning is required, otherwise you will get half of the points.

---

1. Imagine that, one of the friends wants to avoid the other. The problem then becomes a two-player pursuit–evasion game. We assume now that the players take turns moving. The game ends only when the players are on the same node; the terminal payoff to the pursuer is minus the total move taken. An example is shown in Figure 1.
   (a) (2 points) What is the terminal payoff at the node (1)?
   (b) (2 points) What are the positions of the two players at the node (2) and (2)'s children?
   (c) (3 points) Can we assume the terminal payoff at the node (2) is less than -4? Answer yes or no, then explain your answers.
   (d) (3 points) Assume the terminal payoff at the node (4) is less than -4. Do we need expand the node (5) and (6)? Answer yes or no, then explain your answers.

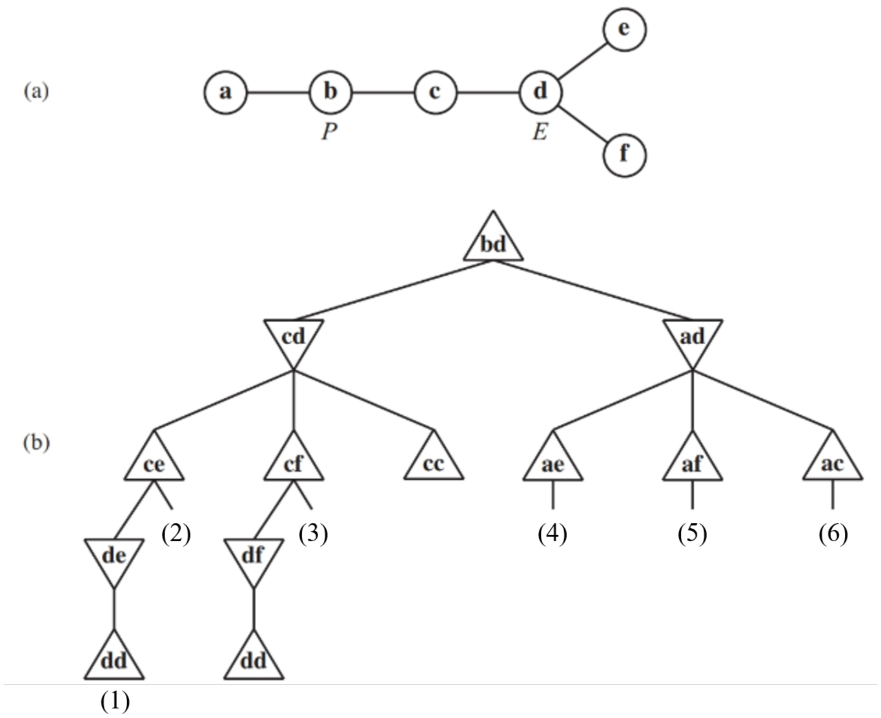

Figure 1: (a) A map where the cost of every edge is 1. Initially the pursuer P is at node b and the evader E is at node d. (b) A partial game tree for this map. Each node is labeled with the P, E positions. P moves first.

2. True or False?
   (a) (2 points) $(A \wedge B) \models (A \Leftrightarrow B)$
   (b) (2 points) $(C \vee (\neg A \wedge \neg B)) \equiv ((A \Rightarrow C) \wedge (B \Rightarrow C))$
   (c) (2 points) $(A \vee B) \wedge (\neg C \vee \neg D \vee E) \models (A \vee B)$
   (d) (2 points) $(A \vee B) \wedge \neg(A \Rightarrow B)$ is satisfiable.

3. (4 points) Prove using **Venn diagram**, or find a counterexample to the following assertion:

$$\alpha \models (\beta \wedge \gamma) \text{ then } \alpha \models \beta \text{ and } \alpha \models \gamma$$