ISLAMIC UNIVERSITY OF TECHNOLOGY (IUT)
ORGANISATION OF ISLAMIC COOPERATION (OIC)
Department of Computer Science and Engineering (CSE)

QUIZ 2   **WINTER SEMESTER, 2021-2022**
DURATION: 20 Minutes   **FULL MARKS: 15**

CSE 4711: Artificial Intelligence

Answer all **2 (two)** questions. Marks of each question and corresponding CO and PO are written in the right margin with brackets.

Student ID: _____

The game SurvivalMan is played in a grid consisting of cells. The protagonist, Pacman, and the antagonist, Ghost take turns moving horizontally or vertically given it does not go beyond the grid. In each turn, the player (Pacman/Ghost) must move to an adjacent cell. Each move requires 2 seconds. The game ends when Ghost catches Pacman. The terminal payoff for Pacman is the amount of time survived.
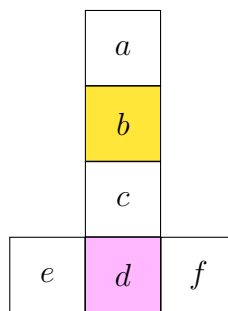

Figure 1: Game Map of SurvivalMan for Questions 1 and 2

Consider that a game of SurvivalMan is being played on the grid shown in Figure 1. Initially, Pacman is in cell b, Ghost is in cell d, and Pacman moves first. As a player controlling Pacman, your target is to evade Ghost as long as possible.

1. Draw the Minimax Tree for SurvivalMan up to depth 4 (maximum two moves for Pacman, and maximum two moves for Ghost). Use up triangles ($\triangle$) for maximizer nodes, down triangles ($\triangledown$) for minimizer nodes, and squares ($\square$) for terminal nodes. Name each node using a pair of values, where the first value denotes the position of Pacman, and the second value denotes the position of Ghost at that state. You also need to show the value for each state.   12 (CO2) (PO2)

Solution:
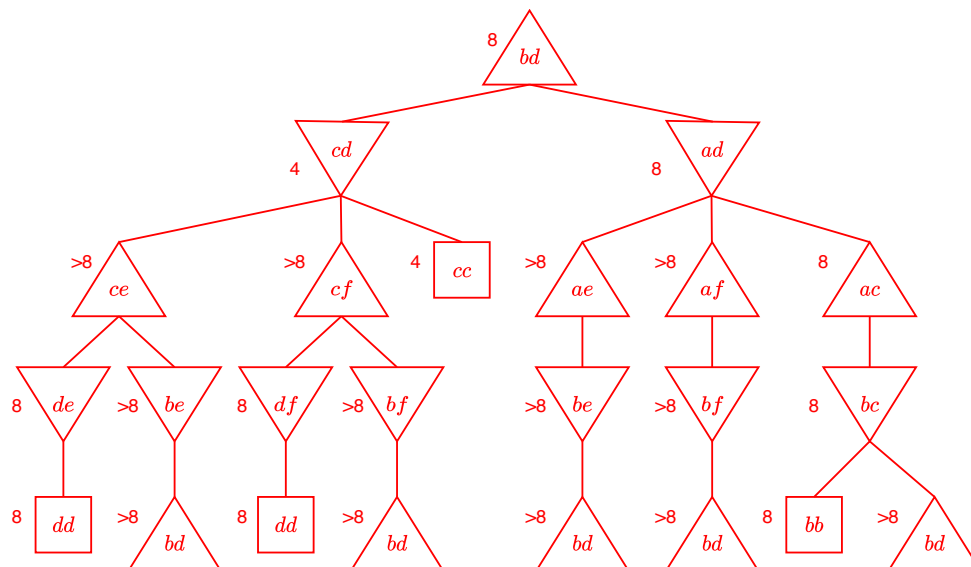
Rubric:

- 0.5 points for each node (should have the correct symbol, value and name).

2. With a brief explanation, determine the maximum score you can get in an optimal play.

3
(CO3)
(PO2)

Solution: From the top value of the Minimax Tree, the answer is 8.

Alternate Solution: From the Game Map, it can be seen that the best Pacman can do is to run away from Ghost. An optimal Ghost will go toward Pacman, and eventually catch it. In that case, it requires 4 steps to catch Pacman. Since each step requires 2 seconds, the maximum score should be $4 \times 2 = 8$.

Rubric:

- 1 point for the correct answer.

- 2 points for the explanation.