United International University (UIU)

Dept. of Computer Science & Engineering (CSE)

Mid Exam: Summer 2021
Course Code: CSI 341, Course Title: Artificial Intelligence

Total Marks: 20   Duration: 1 hour

Answer all questions. Marks are indicated in the right side of each question.

[Any examinee found adopting unfair means will be expelled from the trimester/program as per UIU disciplinary rules.]

1. Suppose, you are going to design an intelligent agent that delivers food from kitchen to customer table in a restaurant. The objective is to deliver the food to the right customer without damaging the product and disturbing other customers. To do that the robot first scans the table id with its camera, determines the path, moves through the side of the tables avoiding obstacles and places the food in the table. The floor may be slippery sometimes.

   Now provide the PEAS description of this intelligent agent.   **[2]**

2. Consider the following Map of Australia. Your goal is to color regions in such a way that no neighboring regions have the same color. You have four colors available: Red, Blue, Green, Yellow. You start from western Australia. When you are at a region, you can color the region or you can move to neighboring regions.
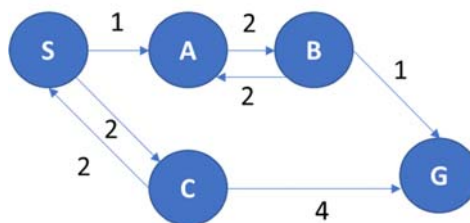
   Now give a formal description of this search problem.   **[2]**

3. (a) Consider the state-space graph in the following figure. S is the start node and G is the goal node. For *uniform cost search algorithm,* draw the search tree and find out the solution paths and costs.   **[3]**

   (b) "Iterative Deepening DFS is not optimal when all the step costs are not identical" – draw a state-space graph and corresponding search tree that supports this statement.   **[2]**

4. a) Suppose that for some specific problem, heuristic function h is admissible. Is h^2 admissible? How about $\sqrt{h}$? If your answer is yes for any of these two functions, would you prefer them over h? Explain your answer. **[3]**

   b) Prove that if h is consistent, n and n' are two nodes on the path to goal and n' is the successor of n, then f(n) <= f(n'). **[2]**

5. a) Consider the 8-puzzle problem where you have a board with 8 numbered tiles and a blank space. Your objective is to arrange the numbered tiles in a specific configuration. A tile can only move to an adjacent blank space. Consider the following start state and goal state:

   Start state

1	8	6
5	-	2
3	4	7

   Goal state

-	1	2
3	4	5
6	7	8

   Suppose you are trying to solve this problem using greedy hill climbing search. Using a suitable heuristic function, show the steps followed in the first two iterations. **[2]**

   b) For what value of T does simulated annealing behave like first choice hill climbing search? Explain why. **[1]**

6. Consider the following game tree. △ Max ▽ Min ☐ Terminal node
   Notice that three terminal nodes marked a, b and c have no values (? marked). Suppose that the red circled nodes are pruned when you apply minimax search algorithm with alpha-beta pruning. Assign appropriate values to a, b, and c that will result in such a pruning. **[3]**