United International **University (UIU)**

Dept. of Computer Science & Engineering (CSE)

Mid Exam
Summer 2019
Course Code: CSI 341 Course Title: Artificial Intelligence
Total Marks: 3**0**   Duration: 1 hour 45 minutes

There are **7** questions. **Answer all questions**. Marks are indicated in the right side of each question.

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1. Suppose you are designing a part picking robot that can pick up different machinery parts from a moving conveyor belt, categorize it and place is in its designated bin. Now answer the following questions:
a. Give PEAS description of the task environment of the part picking robot.[2]
b. Characterize the agent's environment as Fully vs. Partially Observable, Deterministic vs. Stochastic, Episodic vs. Sequential and Single vs. Multiagent.[2]

2. a. Give an example where breadth first search will give optimal result.[2]
b. "Iterative deepening search is wasteful in terms of computational time because states are generated multiple times."---determine whether this statement is true or false and justify your answer.[1]

3. a. Suppose you are designing a navigation robot to navigate a maze with six rooms in it. Your agent can move in four directions: Left:10, Right:15, Up:10 and Down:20 with the given costs. Each move takes it to an adjoining room. The agent starts from room 1 and its goal is to reach room 6. Construct a search tree and determine the optimal plan (solution path) for the robot using the Uniform-cost search algorithm. Use graph-search (avoid generating repeated nodes).[4]

1	2	3
4	5	6

b. Suppose you want to use A* search to solve the above maze solving problem. What can be used as an admissible heuristic function? Explain your answer.[2]

4. a. Solve the following problem using the tree search algorithms mentioned below:[6]
      BFS
      DFS
      Greedy search
      A* search
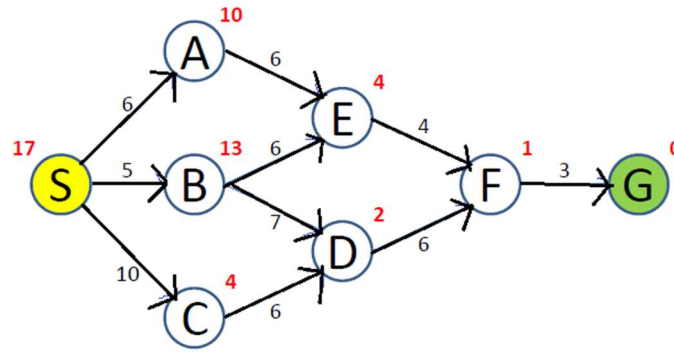
Here S is the start node and G is the goal node. Expand the nodes in alphabetical order in case of ties. Draw the search tree and clearly mention the solution path and cost returned by each algorithm.

b. Will A* graph search be optimal for the above problem? Explain your answer.[2]

5. Justify the following statements as true/false with proper explanation:[4.5]

a. First choice hill climbing performs better for problems with high branching factor.
b. The mutation step of genetic algorithm increases diversification.
c. In simulated annealing, the temperature T is decreased rapidly for better performance.

6. The Travelling Salesperson Problem(TSP) is defined as follows: *Given a list of cities and the distances between each pair of cities, determine the shortest possible route that visits each city exactly once and returns to the origin city.* Can you solve this problem using hill climbing algorithm? If so, how can the problem be formulated? If not, choose any other search algorithm and formulate the problem accordingly. [1.5]

7. Show the nodes that will be pruned in minimax algorithm with alpha-beta pruning for the following tree. [3]