United International **University (UIU)**

Dept. of Computer Science & Engineering (CSE)

Mid Exam: Fall 2020(Makeup)

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.

1. Suppose there is a vacuum cleaner agent that cleans four rooms in a 2X2 grid. The agent can move left, right, up, down and can suck dirt. The goal is to clean all four rooms. [3]
a. What are the variables required to represent a state?
b. What are the possible actions?
c. What is the size of the state space? Explain your calculation.

2. Suppose, you have to solve the problem of routine assignment problem for CSE department. There are 250 sections of different courses offered in Spring 2019. Total number of faculty members is 50. No faculty member can take less than 4 courses and more than 6 courses. You have to assign course sections to faculty members in a way so that no two sections have any conflicts. Now, what algorithm do you suppose to use and why? [2]

3. State whether the following statements are true or false and justify your answer: [2]
    a. Breadth First Search is a special case of Uniform Cost Search algorithm.
    b. Uniform Cost Search is a special case of A* Search algorithm.

4. Consider the following state space graph. Find out the solution paths and costs returned by the following Tree Search algorithms. In case of ties while picking nodes from the fringe follow the alphabetical order. S is the initial state, while G is the goal state. [6]
    i.   IDS   ii.   UCS   iii.   Greedy Search   iv.   A* Tree Search
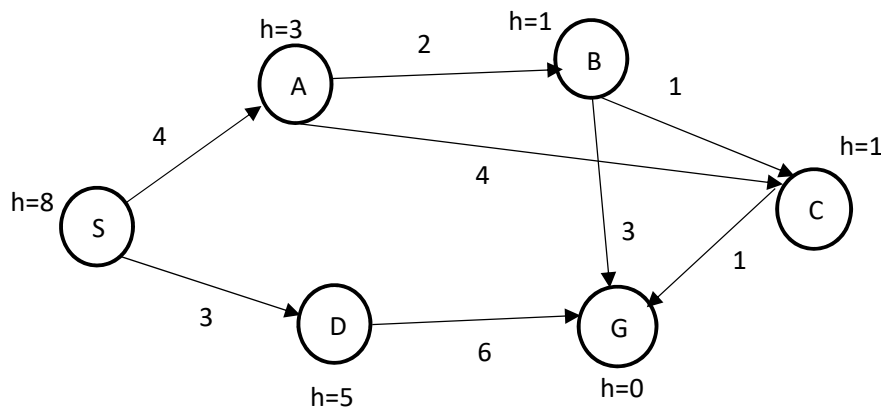
5. Consider the following graph:
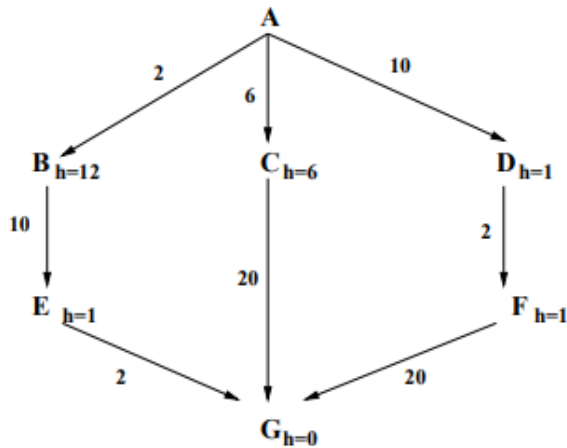
   Is the heuristic h admissible? Is it consistent? Explain your answer. [2]

6. Suppose you have two admissible heuristics, h1 and h2. You decide to create the following new heuristic functions defined as follows:
   a. $h3(n) = \max(h1(n), h2(n))$
   b. $h4(n) = \max(h1(n), 1.1 \times h2(n))$
   c. $h5(n) = \min(h1(n), 3 \times h2(n))$
   d. $h6(n) = (h1(n) + h2(n))/2$

   Among these four which are admissible heuristics? [2]

7. Show the nodes that will be pruned in minimax algorithm with alpha-beta pruning for the following tree. Show values of alpha-beta at each level. [1+2]