

Course No:  
 Course Title:  
 Artificial Intelligence  
 Date: 2018/11/29  
 No. of Questions: 2  
 Time: 1 hours  
 Using Calculator (NO)  
 Using Dictionary (No)

University of Palestine



Second Mid Exam  
 2019/2018  
 Total Grade: 15

Instructor Name: Sally Abdullah  
 Student No.: \_\_\_\_\_  
 Student Name: \_\_\_\_\_  
 College Name: \_\_\_\_\_  
 Section No.: \_\_\_\_\_  
 Dep. / Specialist: \_\_\_\_\_

**Question 1:**

**( 6 marks )**

Give the initial state, goal test, successor function, and cost function for each of the following. Choose a formulation that is precise enough to be implemented

- a. You have to color a planar map using only four colors, in such a way that no two adjacent regions have the same color.

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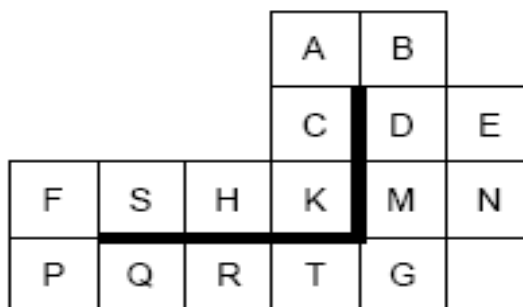
- b. The traveling salesperson problem (TSP) is a touring problem in which each city must be visited exactly once. The aim is to find the shortest tour.

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**Question 2:**

**(9 marks)**

Consider the following maze in which the successors of a cell include any adjacent cell in the directions North, South, East, and West of the current cell, except at the boundary of the maze or when a barrier (thick line) exists. For example, successors (M) = {D; N; G}. Assume each move has cost 1.



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The problem is to find a path from cell S to cell G .What is the order of nodes expanded (plus the goal node if it is found) by each of the following search methods?

(a) Breadth-First Search (without duplicates)

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(b) Depth-First Search. Assume cycles are detected and eliminated by never expanding a node containing a state that is repeated on the path back to the root.

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(c) Greedy Search. Use as the heuristic function  $h(state) = \text{Manhattan distance from state to G}$  assuming there were *no* barriers. For example,  $h(K) = 2$  and  $h(S) = 4$ .

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(d) A\* Search. Use the same heuristic function as in (c). Remove redundant states.

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(e) Is  $h$  an admissible heuristic? Justify your answer.

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**Good Luck**