CS 771 Artificial Intelligence
Spring 2019   Homework 1 (100 points)

Assigned: **Wednesday, February 06, 2019**
Due: **Wednesday, February 13, 2019**

1. For each of the following activities, characterize PEAS task environment specifying whether in each case it is fully/partially observable, deterministic/stochastic, episodic/sequential, static/dynamic, single/multi agent.

   (a) (5 points) playing soccer

   (b) (5 points) part picking robot

   (c) (5 points) solving crossword puzzle

   (d) (5 points) knitting a sweater

2. (5 points) What is the main problem with simple reflex agent? How does model based reflex agent try to solve this problem?

3. (5 points) What could be potential problems of a goal based agent? How does utility based agent try to solve this problem?

4. (30 points) For the following tree shown in Figure 1, list the order in which the nodes are visited for the following three search strategies :

   (a) Breadth-First Search

   (b) Depth-First Search
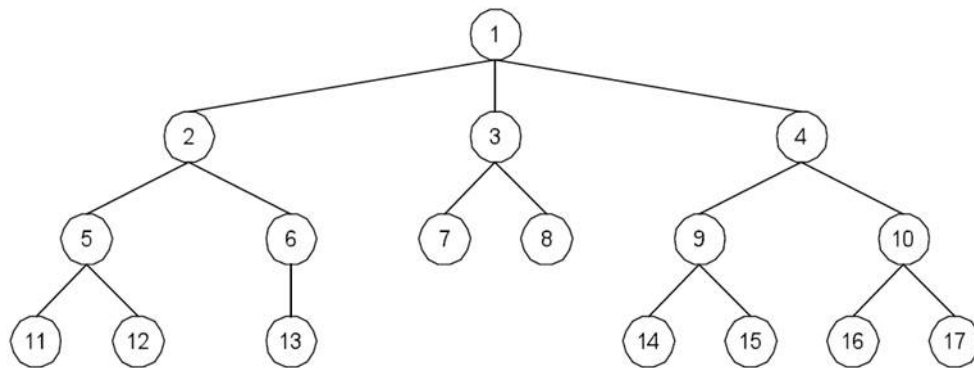
   (c) Depth-First Iterative-Deepening Search

Figure 1: Tree

5. (25 points) Consider the following graph shown in Figure 2. The shaded nodes have already been visited and expanded.

   (a) Draw the search tree that corresponds to this graph (assuming graph search), where the search has started from "A", has just expanded "R".

   (b) Indicate the Frontier of the search tree.

   (c) In a depth first search, what node would be expanded next?

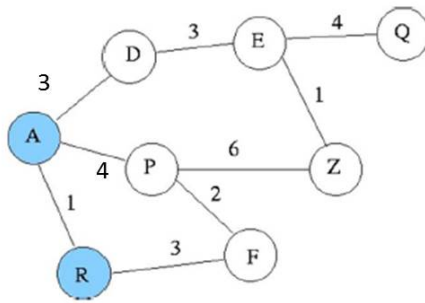   (d) In a breadth-first search, what node would be expanded next?

Figure 2: Graph 1

(e) In a uniform-cost search, what node would be expanded next?

6. (15 points) Consider the following graph in figure 3 that represents road connections between different cities. The weights on links represent driving distances between connected cities. Let S be the initial city and G be the destination. Show how the uniform search works by giving the order in which nodes are expanded. In particular, for each step, show the nodes visited so far and the states and their associated costs in the frontier for that step. Is the path found by the algorithm optimal?
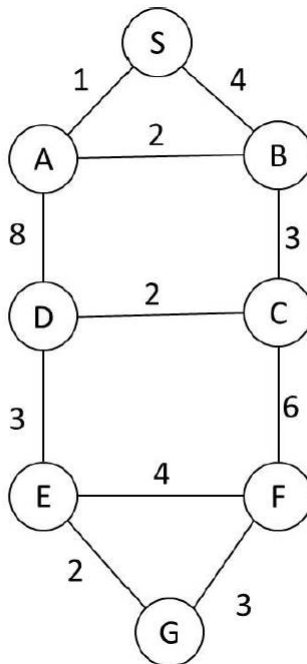

Figure 3: Graph 2