University of Asia Pacific

Department of Computer Science & Engineering

Mid-Semester Examination Fall -2020

Program: B. Sc Engineering (4th Year/ 1st Semester)

Course Title: Artificial Intelligence & Expert Systems Course No. CSE 403/CSE 407 (Backlog)

Credit: 3.00 Time: 1.00 Hour. Full Marks: 60

There are **Four** Questions. Answer any **three including question Q-1 and Q-2**. All questions are of equal value. Figures in the right margin indicate marks.

1. a) Suppose, you are developing a "Coffee Delivery Robot" for UAP CSE Faculty Lounge. Specify the **PEAS** description of your intelligent agent. 10

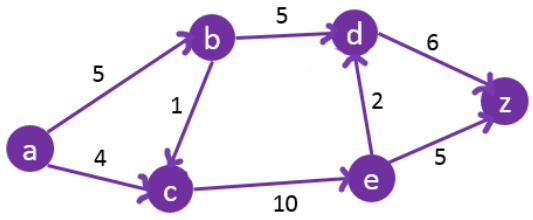
   b) For the above agent, characterize the environment whether it is: 10
   i) fully observable or partially observable, ii) deterministic or stochastic, iii) episodic or sequential, iv) static, dynamic, or semi-dynamic v) discrete or continuous, vi) single agent or multi-agent. Explain your answer.

2. Your target is to reach the goal node 'z' from start node 'a' with the most optimum cost. Simulate the following problem with **A* algorithm**, draw the search tree and determine the shortest path **with fringe** for **each iteration**. Assume that states with earlier alphabetical order are expanded first. The heuristic values of the 6 nodes are as follows: 20

h(a) = (Last 2 digits of your id) % 3 + 3	h(b) = (Last 2 digits of your id) % 6 +2
h(c) = (Last 2 digits of your id) % 4 + 2	h(d) = (Last 2 digits of your id) % 2 + 3
h(e) = (Last 2 digits of your id) % 5 + 1	h(z) = 0

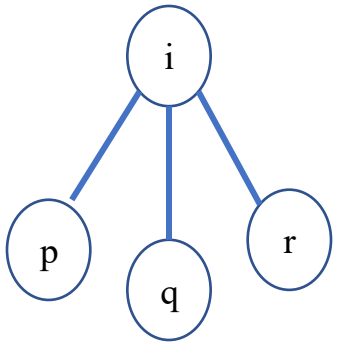
Here % refers to **mod** operation. For example, if the last two digits of someone's id is 16 then

h(a) = 16 % 3 + 3 = 4
h(b) = 16 % 6 + 2 = 6
h(c) = 16 % 4 + 2 = 2
h(d) = 16 % 2 + 3 = 3
h(e) = 16 % 5 + 1 = 2
h(z) = 0



3. a) Can you differentiate between intelligent agent and rational agent? State your own answer. 5

b) Consider a state space where the start state is ***i*** and the successor function for state ***i*** return 3 states such as: p, q, r where ***i*** = (Last 2 digits of your id % 3) + 1. Here **%** **refers** to **mod** operation. 15



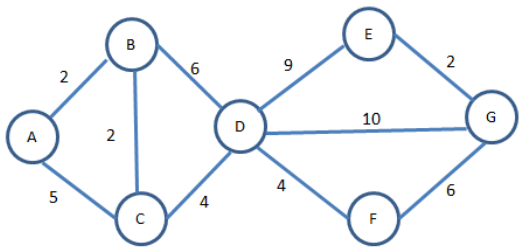
i = (Last 2 digits of your id % 3) + 1
p = 3***i*** - 1
q = 3***i***
r = 3***i*** + 1
Here p, q, r are the child of node ***i*** and each p, q, r node will have its own 3 child in the next level.

For Example:
If someone's id is 35 then
i = 35 % 3 + 1 = 2 + 1 = 3 (Root)
p = 3x3 – 1 = 9 - 1 = 8 (left child)
q = 3x3 = 9 (middle child)
r = 3x3 + 1 = 9 + 1 = 10 (right child)
Leaf node value = ***i*** + 26 = 29
Goal node value = ***i*** + 25 = 28

i. Draw a search tree from root node value ***i*** to leaf node value **(*i* + 26)**
ii. Suppose the goal state is **(*i* + 25)**. Find out the sequence/order in which the nodes will be visited for:
(1) Breadth-First Search (BFS) and (2) Iterative Deepening Search (IDS)

4. a) "An AI agent interacts with its environment". Justify your answer with necessary diagram. 5

b) Consider the following state space graph where A is the start state and G is the goal state. Suppose you are completing the heuristic function h_1 shown below. All the values are fixed except $h_1(B)$. 15



Node	h_1
A	11
B	**?**
C	10
D	8
E	2.5
F	5.5
G	0

i. Determine what values of $h_1(B)$ make h_1 admissible?
ii. Determine what values of $h_1(B)$ make h_1 consistent?