

University of Asia Pacific

Department of Computer Science & Engineering

Mid-Semester Examination Spring-2021

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

Course Title: Artificial Intelligence and Expert Systems Course No. CSE 403

Credit: 3.00

Time: 1.00 Hour.

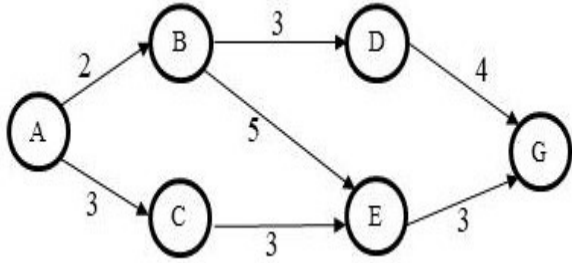
Full Marks: 60

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

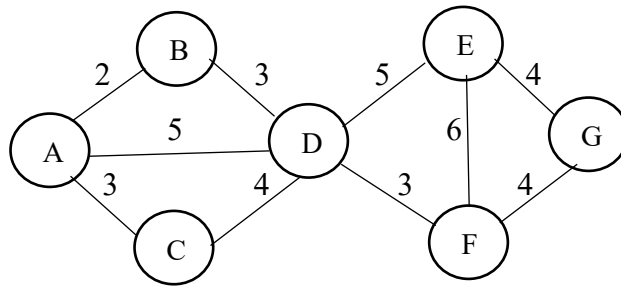
1. a) What is Turing Test? What are the capabilities that an intelligent machine should possess to pass the Turing Test? What are the additional capabilities to pass the Total Turing Test? 2+5
+3
- b) Suppose, you are developing a “**Trash Picking Robot**” to clean the UAP backyard. 10
Specify the **PEAS** description of your intelligent agent.
2. Your target is to reach the goal node ‘G’ from initial node ‘A’ with the optimal cost. 20
Simulate the following problem with A* search algorithm. Draw the search tree and **determine** the shortest path **with fringe** for **each iteration**. Assume that the states with earlier alphabetical order are to be expanded first. The heuristic values of the 6 nodes are as follows:

$h(A) = (\text{last 2 digits of your ID}) \% 4 + 2$	$h(B) = (\text{last 2 digits of your ID}) \% 5 + 3$
$h(C) = (\text{last 2 digits of your ID}) \% 6 + 1$	$h(D) = (\text{last 2 digits of your ID}) \% 5 + 2$
$h(E) = (\text{last 2 digits of your ID}) \% 4 + 1$	$h(G) = 0$

Here % refers to **mod** operation which finds the remainder. For example, if the **last two digits** of someone’s **ID** is **12** then:

$h(A) = 12 \% 4 + 2 = 0 + 2 = 2$	
$h(B) = 12 \% 5 + 3 = 2 + 3 = 5$	
$h(C) = 12 \% 6 + 1 = 0 + 1 = 1$	
$h(D) = 12 \% 5 + 2 = 2 + 2 = 4$	
$h(E) = 12 \% 4 + 1 = 0 + 1 = 1$	
$h(G) = 0$	

3. a) Differentiate the following agents in your own words: Simple Reflex Agent and Model-based Reflex Agent. 5
- b) Generate a state space graph of 6 nodes. Show the differences between the sequences/orders in which the nodes of a search tree will be visited for: 15
- Breadth-First Search (BFS)
 - Depth-First Search (DFS)
 - Iterative Deeping Search (IDS)
4. a) Explain the components of the intelligent agent in your own words. 5
- b) Consider the following state space graph where A is the initial state and G is the goal state. Suppose, you are completing the heuristic function h_2 shown below. All the values are fixed except $h_2(C)$. 15



Node	A	B	C	D	E	F	G
h_2	9	7	?	5	3	3	0

- Determine for which value of $h_2(C)$ makes h_2 admissible?
- Determine for which value of $h_2(C)$ makes h_2 consistent?