REG.NO.:

SLOT: D1+TD1

SCHOOL OF COMPUTER SCIENCE AND ENGINEERING
CONTINUOUS ASSESSMENT TEST - I
FALL SEMESTER 2025-2026

Programme Name & Branch : **B.Tech. & Computer Science & Engineering / SCOPE**
Course Code and Course Name : **Artificial Intelligence & BCSE306L**
Faculty Name(s) : **All**
Class Number(s) : **Common for all batches**
Date of Examination : **20-8-2025**
Exam Duration : **90 minutes** **Maximum Marks: 50**

General instruction(s):

- Answer All Questions
- M - Max mark; CO – Course Outcome; BL – Blooms Taxonomy Level (1 – Remember, 2 – Understand, 3 – Apply, 4 – Analyse, 5 – Evaluate, 6 – Create)
- Course Outcomes: (Type the CO statements covered in this question paper. Use the CO number as per the syllabus copy)

Q. No	Question	M	CO	BL
1.	An AI agent is supposed to manage the energy consumption of a smart home. The agent's objective is to minimize the electricity bill while ensuring the residents' comfort. It has access to weather forecasts, real-time electricity pricing from the grid, and sensors in each room (temperature, occupancy). It can control the heating, ventilation, and air conditioning (HVAC) system, the smart lighting, and high-consumption appliances like the dishwasher and washing machine. What is the correct PEAS categorization for this agent? Classify this task environment according to the following properties- Deterministic vs. Stochastic, Static vs. Dynamic, and Episodic vs. Sequential, and briefly justify your choices. What strategy should the agent adopt to effectively balance cost minimization with maintaining comfort?	10	CO1	BL 2
2.	a) A Roomba vacuum cleaner's objective is a completely clean room. To achieve this, it uses its internal map to plan the most efficient path, ensuring it systematically covers every area without repetition. Which agent architecture best describes the Roomba? Explain with schematic diagram.	5	CO1	BL 1
	b) What is the key difference between a Goal-Based Agent and a Utility-Based Agent? Provide an example where a Utility-Based Agent would be more suitable compared to a goal based agent.	5		
3.	A Weighted Maze problem is having a 6x6 grid that represents a maze with different types of terrain as given below. Your goal is to find the path with the minimum cost from a starting point 'S' to a goal 'G'.	10	CO4	BL 3

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S	.	.	#	.	.
.	#	.	.	.	#
.	#	.	W	.	.
.	.	.	#	#	.
#	W	W	.	.	.
.	.	.	.	#	G

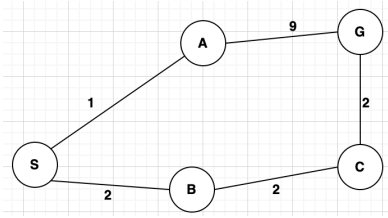
Maze Rules:

- You can move up, down, left, or right.
- You cannot move into cells, marked with '#'.
- Movement has a cost associated with the terrain type:
  - Moving into a normal path cell ('.') has a cost of **1**.
  - Moving into a watery swamp cell ('W') has a cost of **2**.

Represent systematic exploration of paths to find the optimal one using Uniform Cost Search algorithm.

Hint: states can be represented as coordinate tuples `(row, col)`, with the initial state at `(0, 0)` and the goal at `(5, 5)`.

4.	a) An autonomous delivery drone must navigate from a starting depot ('S') to a final destination ('G'). The drone can travel between several intermediate waypoints ('A', 'B', 'C'). The actual travel cost (e.g., energy consumed) between waypoints is known. To guide its search for the most efficient route, the drone's A* algorithm can use one of two different pre-computed heuristic functions, `h1(n)` or `h2(n)`.	5	CO4	BL 4
	b) Based on the results from the two searches performed above, did both heuristics lead to the optimal path? Which heuristic (`h1` or `h2`) is admissible here and explain optimality based on the admissible feature.	5		



Node (n)	h1(n)	h2(n)
S	5	5
A	8	3
B	3	8
C	1	1
G	0	0

What is the final path and its total cost from A to G when A* is conducted using the two heuristic functions, `h1(n)` and `h2(n)`.?

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5.	A search problem is given and it involves finding the global maximum of a function that has multiple local maxima. While executing, Hill Climbing stops at a local maximum far from the global maximum. However, Simulated Annealing starts from the same initial state but eventually reaches the global maximum. Write the algorithms and compare the fundamental search strategies of both. Explain in detail why Hill Climbing got stuck at the local maximum while Simulated Annealing succeeded. Propose a modification to Hill Climbing that might help it overcome local maxima, and explain how this change would affect its search behavior.	10	CO4	BL4

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