Sample

0009

THE OPEN UNIVERSITY OF SRI LANKA
BSc (IT) DEGREE PROGRAMME: LEVEL 04
FINAL EXAMINATION: 2024/2025
COU4303: ARTIFICIAL INTELLIGENCE

DURATION: **TWO HOURS** (2 HOURS)

Date: 17.11.2025 **Time: 9.30 a.m. – 11.30 a.m.**

Answer FOUR (04) questions only.

1)

a) What are the four (04) categories of definition of AI fall into?

(4 Marks)

b) What are the essential capabilities a computer must have in order to take or pass the Turing Test?

(6 Marks)

c) Provide a PEAS description of a self-driving car.

(7 Marks)

d) Describe Model-based reflex agent using an example.

(8 Marks)

2)

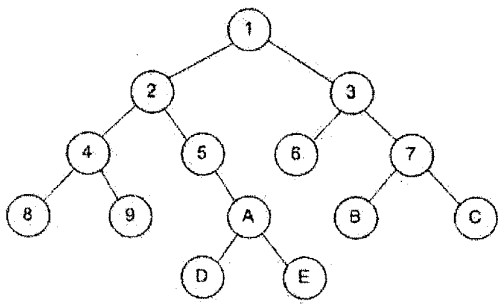
a) What is the main goal of search algorithms in AI?

(4 Marks)

b) What is the difference between Breadth-First Search (BFS) and Depth First Search (DFS) in AI?

(6 Marks)

Consider the following tree shown in the diagram to answer the following questions c) and d).



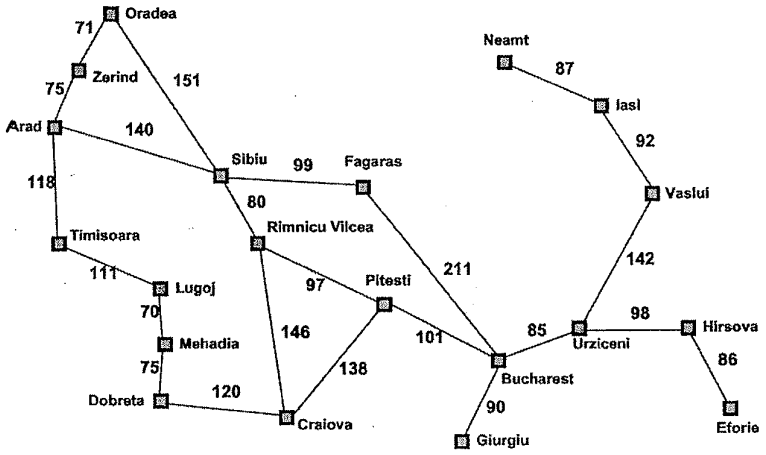
c) Traverse the tree using Iterative Deepening Depth-First Search (IDDFS) starting from node 1. List the order of visited nodes until the goal node E is found.

(7 Marks)

d) Traverse the tree using Breadth-First Search (BFS) starting from node 1. Find the order of visited nodes and the path to reach the goal node E. Show each level of traversal clearly and explain why BFS guarantees the shortest path in this case.

(8 Marks)

3) Consider the following Romania map and answer the questions from a) to d):



Straight-line distance to Bucharest	
Arad	366
Bucharest	0
Craiova	160
Dobreta	242
Eforie	161
Fagaras	178
Giurgiu	77
Hirsova	151
Iasi	226
Lugoj	244
Mehadia	241
Neamt	234
Oradea	380
Pitesti	98
Rimnicu Vilcea	193
Sibiu	253
Timisoara	329
Urziceni	80
Vaslui	199
Zerind	374

a) List the cities directly connected to Arad and their distances.

(4 Marks)

b) Using Uniform Cost Search, determine the path from Arad to Sibiu and show the steps.

(6 Marks)

c) Apply Greedy Best-First Search with straight-line distance heuristic to find a path from Arad to Bucharest.

(7 Marks)

d) Using A* search, compute the shortest path from Arad to Bucharest, showing $f(n) = g(n) + h(n)$ at each step.

(8 Marks)

4)

a) Define local search algorithms and mention two (02) advantages of using them over classical search algorithms.

(4 Marks)

b) Describe the Hill Climbing Search Algorithm and explain when the algorithm stops.

(6 Marks)

c) What are the four (04) types of Hill Climbing Algorithms? Explain two (02) of them.

(7 Marks)

d) What are the disadvantages of the Hill Climbing and explain how these issues can be overcome.

(8 Marks)

5)

a) What is meant by stochastic search algorithms? List two (02) real-world problems where stochastic search methods are preferred over deterministic approaches.

(4 Marks)

b) Explain the working principle of Simulated Annealing.

(6 Marks)

c) Describe what are the key concepts in Genetic Algorithm (GA).

(7 Marks)

d) Explain the Monte Carlo Tree Search (MCTS) algorithm with its four key phases. Discuss its advantages and limitations, and mention at least one practical application.

(8 Marks)

6)

a) Name two (02) games which are deterministic and have perfect information.

(4 Marks)

b) What is a Game Tree in a game? Explain it in your own words.

(6 Marks)

c) What are the four (04) things the Problem Definition Language (PDDL) describes, when we need to define a search problem.

(7 Marks)

d) Consider a scenario where a robot is cleaning two rooms; Room1 and Room2. The robot can perform the following actions: Move, PickDust, and DropDust. Write a domain description in PDDL to represent this cleaning scenario. Include suitable predicates and actions to describe the robot's behaviour.

(8 Marks)