

JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -1 EXAMINATION- 2025

B.Tech- 8th Semester (ECE)

COURSE CODE (CREDITS): 18B1WEC838 (3)

MAX. MARKS: 15

COURSE NAME: Artificial Intelligence Techniques

COURSE INSTRUCTORS: Dr. Naveen Jaglan

MAX. TIME: 1 Hour

Note: (a) All questions are compulsory.

(b) The candidate is allowed to make Suitable numeric assumptions wherever required for solving problems.

Q.No	Questions	CO	Marks
Q1	<p>Consider a state space where the start state is number 1 and each state k has two successors: numbers $2k$ and $2k + 1$.</p> <p>(a) Draw the portion of the state space for states 1 to 15.</p> <p>(b) Suppose the goal state is 11. List the order in which nodes will be visited for breadth-first search, depth-limited search with limit 3, and iterative deepening search.</p> <p>(c) How well would bidirectional search work on this problem? What is the branching factor in each direction of the bidirectional search?</p> <p>(d) Does the answer to (c) suggest a reformulation of the problem that would allow you to solve the problem of getting from state 1 to a given goal state with almost no search?</p> <p>(e) Call the action going from k to $2k$ Left, and the action going to $2k + 1$ Right. Can you find an algorithm that outputs the solution to this problem without any search at all?</p>	1	3
Q2	<p>Write a Python program to perform Breadth-First Search (BFS) traversal on the given graph starting from node 'A':</p> <pre> graph TD A --- B A --- C B --- D B --- E C --- E C --- F D --- G E --- G E --- H F --- H </pre>	2	3

	<p>(a) Implement BFS using a queue (FIFO).</p> <p>(b) Return the order in which the nodes are visited.</p> <p>(c) Assume the graph is stored as an adjacency list in a dictionary.</p>		
Q3	<p>A monkey is in a room where:</p> <p>(1) There is a banana hanging from the ceiling, out of reach.</p> <p>(2) A box is present in the room, which the monkey can move and climb.</p> <p>(3) The monkey can walk on the floor, push the box, and climb the box to reach the banana.</p> <p>(4) The goal is to determine a sequence of actions that allow the monkey to get the banana.</p> <p>Define the state space for the Monkey and Banana Problem. What are the initial and goal states? Represent the problem as a state transition graph.</p>	2	3
Q4	Define PEAS for an AI home automation system that controls lights, temperature, and security. How does the agent handle multiple sensors to make intelligent decisions?	1	2
Q5	Compare different uninformed search strategies in terms of completeness, time complexity, space complexity, and optimality. Provide an analysis of when each algorithm is preferred. Under what conditions does UCS behave exactly like BFS?	1	2
Q6	Suppose an AI agent must choose between two paths in a navigation system. The utility function $U(x) = 10 - \text{cost}(x)$ is given, where $\text{cost}(x)$ represents energy consumption. If Path A has a cost of 3 units and Path B has a cost of 7 units, which path will the agent choose? Why?	1	2