

JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -2 EXAMINATION- 2025

B.Tech- 8<sup>th</sup> Semester (ECE)

COURSE CODE (CREDITS): 18B1WEC838 (3)

MAX. MARKS: 25

COURSE NAME: Artificial Intelligence Techniques

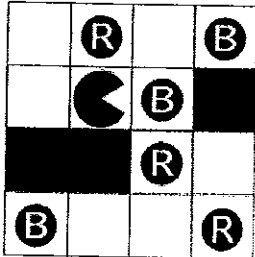


COURSE INSTRUCTORS: Dr. Naveen Jaglan

MAX. TIME: 1 Hour 30 Min

**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>Use AO* algorithm step by step to find the lowest cost path from the starting node to the goal node. It should be noted that the cost of each edge is the same as 1, and the heuristic cost to reach the goal node from each node of the graph is shown beside it.</p> <pre> graph TD     A((A)) --- B((B))     A --- C((C))     A --- D((D))     B --- E((E))     B --- F((F))     C --- G((G))     C --- H((H))     C --- I((I))     D --- J((J)) </pre>	3	5
Q2	<p>Write a Python program to perform Depth-First Search (DFS) program to use an explicit stack (instead of recursion) to traverse the graph from node 'A':</p> <pre> graph TD     A((A)) --- B((B))     A --- C((C))     B --- D((D))     B --- E((E))     C --- F((F))     E --- G((G))     E --- H((H)) </pre> <p>(a) Print the order in which nodes are visited.  (b) Ensure nodes are processed in Last In, First Out (LIFO) order.  Assume the graph is stored as an adjacency list in a dictionary.</p>	3	5
Q3	<p>There are two kinds of food pellets, each with a different color (red and blue). Pacman is only interested in tasting the two different kinds</p>	2	5

	<p>of food: the game ends when he has eaten 1 red pellet and 1 blue pellet (though Pacman may eat more than one of each pellet). Pacman has four actions: moving up, down, left, or right, and does not have a "stay" action. There are K red pellets and K blue pellets, and the dimensions of the board are N by M.</p>  <p style="text-align: center;"><math>K = 3, N = 4, M = 4</math></p> <p>(a) Give an efficient state space formulation of this problem. Specify the domain of each variable in your state space.</p> <p>(b) Assuming Pacman starts the game in position (x, y), what is the initial state?</p> <p>(c) Define a goal test for the problem.</p> <p>Is the following heuristic admissible, give reasons: The smallest Manhattan distance to any remaining pellet.</p>		
Q4	<p>Find the solution to the following blocks world problem using simple hill method. State the heuristics used. What are the limitations of hill climbing algorithms?</p> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;">  <p>Initial State</p> </div> <div style="text-align: center;">  <p>Final State</p> </div> </div>	3	4
Q5	<p>Discuss the time and space complexity of the A* algorithm in different scenarios. How do factors like the heuristic function, graph size, and branching factor affect its performance? What techniques can be used to reduce memory usage while maintaining efficiency?</p>	4	4
Q6	<p>A self-driving car needs to balance safety (S), speed (V), and fuel efficiency (F) using the following utility function:  <math>U = 0.5S + 0.3V + 0.2F</math>  <math>U = 0.5S + 0.3V + 0.2F</math>          If an AI evaluates three routes with values <math>S_1 = 8, V_1 = 6, F_1 = 5</math>; <math>S_2 = 7, V_2 = 7, F_2 = 6</math>, and <math>S_3 = 6, V_3 = 8, F_3 = 7</math>, which route will the agent select?</p>	1	2