JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -1 EXAMINATION- 2025

M.Tech-2nd Semester (ECE)

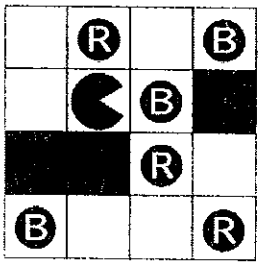
COURSE CODE (CREDITS): 21M11EC212 (3) MAX. MARKS: 15

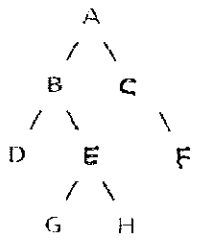
COURSE NAME: Artificial Intelligence and Expert Systems

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	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 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.  $K = 3, N = 4, M = 4$ (a) Give an efficient state space formulation of this problem. Specify the domain of each variable in your state space. (b) Assuming Pacman starts the game in position (x, y), what is the initial state? (c) Define a goal test for the problem. (d) Is the following heuristic admissible, give reasons: The smallest Manhattan distance to any remaining pellet.	1	3
Q2	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':	2	3

	 (a) Print the order in which nodes are visited. (b) Ensure nodes are processed in Last In, First Out (LIFO) order. (c) Assume the graph is stored as an adjacency list in a dictionary.		
Q3	There are three missionaries and three cannibals on one side of the river. A boat can carry at most two people at a time. The goal is to move everyone to the other side without ever having more cannibals than missionaries on either side, as cannibals would eat the missionaries. (a) Define the state space for the Missionaries and Cannibals problem. (b) How many valid states exist in the problem? (c) What is the initial state and the goal state?	2	2
Q4	Define the PEAS framework for an AI-powered medical diagnosis system. How does the environment change when diagnosing different diseases?	2	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	3
Q6	A self-driving car needs to balance safety (S), speed (V), and fuel efficiency (F) using the following utility function: U=0.5S+0.3V+0.2FU = 0.5S + 0.3V + 0.2FU=0.5S+0.3V+0.2F If an AI evaluates three routes with values S1 = 8, V1 = 6, F1 = 5; S2 = 7, V2 = 7, F2 = 6, and S3 = 6, V3 = 8, F3 = 7, which route will the agent select?	1	2