JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -1 EXAMINATION- 2024

M.Tech-II Semester (ECE-IoT)

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

COURSE NAME: Artificial Intelligence and Expert Systems

COURSE INSTRUCTOR: Dr. Naveen Jaglan MAX. TIME: 1 Hour

Note: (a) All questions are compulsory.

(b)Marks are indicated against each question in square brackets.

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

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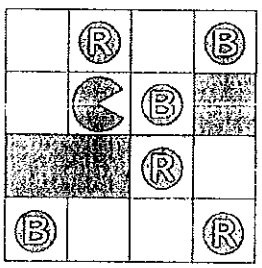
1. Consider a state space where the start state is number 1 and each state k has two successors: numbers 2k and 2k + 1.

(a) Draw the portion of the state space for states 1 to 15.
(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.
(c) How well would bidirectional search work on this problem? What is the branching factor in each direction of the bidirectional search?
(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?
(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?

[CO-1; 5 marks]

2. 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.

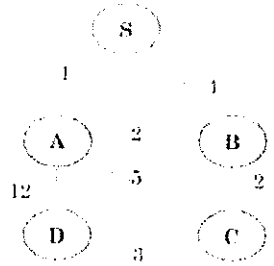
[CO-1; 4 marks]

3. Prove each of the following statements, or give a counter example:

(a) Breadth-first search is a special case of uniform-cost search.
(b) Depth-first search is a special case of best-first tree search.
(c) Uniform-cost search is a special case of A* search.

[CO-2; 3 marks]

4. For the search space shown below, find the optimal path from S to D using the heuristic values defined in table.



Node	Heuristic Value
S	7
A	6
B	2
C	1
D	0

[CO-2; 3 marks]