Semester: 6th
Subject Name: Artificial Intelligence & Code:CS-3011
Branch (s): -IT

SPRING MID SEMESTER EXAMINATION-2024

School of Computer Engineering
Kalinga Institute of Industrial Technology, Deemed to be University
Artificial Intelligence
[CS-3011]

Time: 1 1/2 Hours **Full Mark: 20**

Answer Any four questions including question No.1 which is compulsory.
The figures in the margin indicate full marks. Candidates are required to give their answers in their own words as far as practicable and all parts of a question should be answered at one place only.

1. Answer all the questions. [1 Mark X 5]

a) What are the various disciplines that AI is founded on? Mention six capabilities that a computer should possess to qualify for Total Turing Test.

b) In A* search, what are Admissible heuristic and Consistent heuristic? What is relation between them?

c) Write down at least two differences between Breadth First Search (BFS) and Depth First Search (DFS) techniques as far as the performance parameters are concerned.

d) Give at least two reasons to justify why rational agent approach is superior to other three approaches of AI.

e) In the following 8-puzzle problem, the true solution cost is 8. This means that it takes minimum 8 number of steps to reach the given final state from the given initial state. Justify for this case that both the heuristics h1 (Number of misplaced tiles) and h2 (Total Manhattan distance) are admissible heuristics.

Initial State

2	4	
6	1	8
7	3	5

Goal State

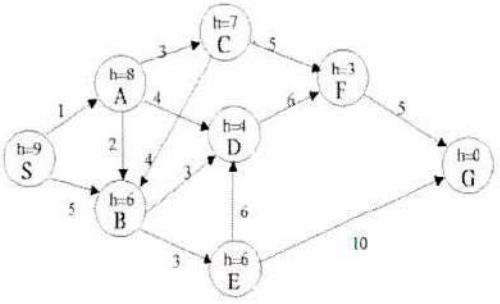
2	8	
3	4	1
6	7	5

2.

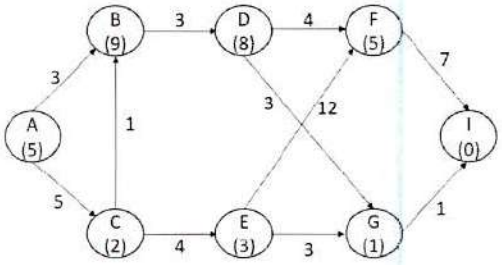
(a) Discuss the "optimality" property of BFS, DFS and IDS algorithm with suitable example.
(b) Derive the time and space complexity of IDS considering the branching factor is 2 with proper mathematical expression. [3+2]

3. Apply A* algorithm is the following two graphs. Show the step-by-step execution and find the optimal path and path cost for these graphs using A*. For 1st graph Stating State and Final state is S and G respectively. For 2nd graph Stating State and Final state is A and I respectively. In which

graph/graphs among these two A* will give optimal solution? Example with proper information. [3+2]



(1)



(2)

4.

(a) Consider a Hypothetical Agent Called DishPutter, this agent will fill your dishwasher for you. All you have to do is leave your dirty dishes around the kitchen and DishPutter will move them into the dishwasher for you. DishPutter will turn on when you push its "on" button. It will move around the kitchen, pick up dishes with its cushioned claws, put them in the dishwasher, start the washer, and then play a song while it powers back down. It is very good at organizing dishes in the dishwasher to conserve space. Write the PEAS representation for the above-mentioned agent.
(b) Explain the working Principle of "Learning Agents" and "Goal-Based Agents" with proper diagram. Discuss the different between "Goal" and "Utility" In terms of AI agents. [2+3]

5.

(a) Consider a Simple two-room vacuum cleaner agent. Draw the state-space diagram by considering the following details for it:
Type of Agent: Simple Reflex
Environment: Room A, Room B (A is on left side of B), Dust.
Percepts : [location and contents] i.e. (A, Dirty)/ (B,Clean)
Actions: Left, Right, Suck.
Agent Function: two-room vacuum cleaner -agent ([location, status]) returns an action
if status = Dirty then return Suck
else if location = A then return Right
else if location = B then return Left
Initial state: (A, Dirty).
(b)Consider a binary search tree where the initial node is number 1 and each node k has two children: numbers 2k and 2k + 1.
I) Draw the portion of the search tree from node 1 to node 15.
II) Suppose the goal node is 13. List the order in which nodes will be visited and number of times each node will be visited for
A) breadth first search (BFS),
B) iterative deepening search (IDS). [3+2]

*** Best of Luck ***