Semester: 5th
Subject Name:- AI & Code:- CS30002
Branch (s): - IT

AUTUMN MID SEMESTER EXAMINATION-2024
School of Computer Engineering
Kalinga Institute of Industrial Technology, Deemed to be University
Artificial Intelligence
CS30002

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) Which of the following best describes a state space in problem-solving?
i. A list of all possible actions an agent can take.
ii. A representation of all possible states and transitions in a problem domain.
iii. A method for tracking the agent's current position.
iv. A record of past actions taken by the agent.

b) Suppose that breadth first search expands N nodes for a particular graph. What will be the maximum number of nodes expanded by Iterative Deepening search ?

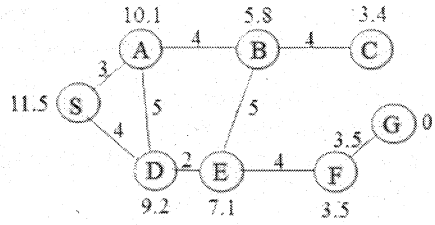
c) What is the evaluation function in A* approach?
i. Heuristic function
ii. Path cost from start node to current node
iii. Path cost from start node to current node + Heuristic cost
iv. Average of Path cost from start node to current node and Heuristic cost

d) Suppose hill climbing procedure has a probability p=0.2 of getting successful in a particular run. What is the expected number of runs required for hill climbing with random restarts to be successful?

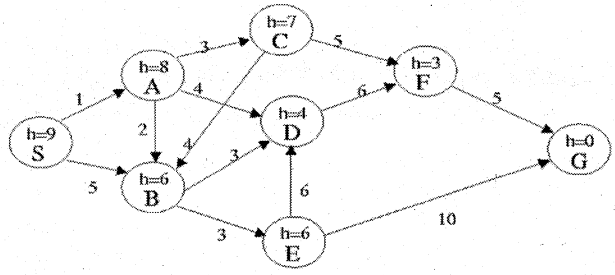
e) Construct a finite search tree for which it is possible that depth-first search uses more memory than breadth-first search. Please highlight the goal nodes in your tree.

2. Discuss the concept of a learning agent in artificial intelligence. How does a learning agent adapt its behavior based on experience? Discuss the advantages and limitations of using a utility-based approach. [5Marks]

3. Consider the search problem below. The transition costs are next to the edges, and the heuristic values are above the states. Identify the Source and the Goal and give reasons for the same.If A* algorithm is used, what is the path? [5 Marks]



4. a) Consider the following graph-having the start state is S, and the goal state is G. The transition costs are next to the edges, and the heuristic estimate, h, of the distance from the state to the goal is in the state's node. Assume ties are always broken by choosing the state which comes first alphabetically. Answer the following [3 Marks]



I. What is the order of states expanded using Depth First Search? Assume DFS terminates as soon as it reaches the goal state.

II. What is the order of states expanded using Breadth First Search?

III. What is the order of states expanded using UCS? Assume UCS terminates as soon as it reaches the goal state.

b) Describe the evaluating Search strategies used for Iterative deepening search and Breadth first search? [2 Marks]

5. For a Five-Queen problem, find the solution with the help of Genetic Algorithm. The initial population to be considered are: [52435, 43514, 21324, 52341]. The crossover is done at crossover point 2 for the first pair of parents (i.e. parents 1 and 2) and at crossover point 3 for the second pair of parents (i.e. parents 3 and 4). Assume the objective function (fitness function) is the number of non-attacking Queens. [5 Marks]

*** Best of Luck ***