Semester: 5th
Subject Name:- AI & Code:- CS
Branch (s): - CS/IT/CSCE/CSSE

# AUTUMN MID SEMESTER EXAMINATION-2023

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

**Time: 1 1/2 Hours** **Full Mark: 40**

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***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. [ 2 x 5=10 Marks ]

   a) Who is Alan Turing? Has ChatGPT-3 passed the Turing test?

   b) Describe the types of searching techniques—uninformed search and informed search. Why is "searching" important in artificial intelligence? Justify your answer.

   c) Doubling your computer's speed allows you to double the depth of a tree search given the same amount of time—is this true or false? Give a brief explanation of your answer.

   d) Explain analytically, why IDS is a better uninformed search strategy as compared to BFS for the same **b** (branching factor) and **d** (depth of shallowest goal node). Assume the values for **b** and **d**.

   e) Justify why consistent heuristic is known as triangle heuristic? How is optimality of A* search linked to Admissible heuristic and Consistent heuristic?

2. [ 5+5=10 Marks ]

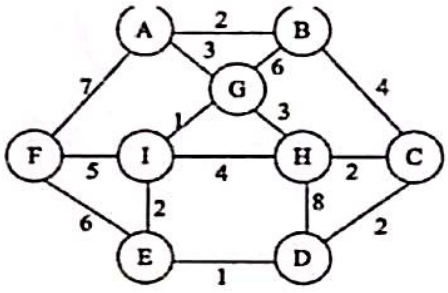
a) Briefly explain the performance measure criteria for search algorithms. Discuss those criteria for the following searching algorithms

I. Depth-first Search

II. Depth-limited Search

III. Depth-first Iterative Deepening Search

b) Consider the following undirected weighted graph. Apply greedy Best-First Search algorithm to find the shortest path and cost between the initial state 'A' and goal state 'D'. Also, briefly explain why the Best-First search is considered "greedy".



3. [ 5+5=10 Marks ]

a) Illustrate the significance of PEAS in Artificial Intelligence. Specify the following agents based on PEAS to determine their task environments in a tabular manner:

I. Chandrayaan-3 Vikram lander

II. Robotic news anchor

b) Define and design the state-space graph for Missionaries and Cannibals problem in Artificial Intelligence. How can various search algorithms, such as Breadth-first search, and Depth-first search, be applied to explore the state-space graph of the Missionaries and Cannibals problem, and what are the trade-offs in terms of efficiency and optimality among these algorithms?

4: [ 4+6=10 Marks ]

a) Define the "state-space" in Artificial Intelligence. How does one stop the repeated states in a state-space search?

b) A Mars rover has to leave the lander, collect rock samples from three places (in any order) and return to the lander. Assume that it has a navigation module that can take it directly from any place of interest to any other place of interest. So it has primitive actions **go-to-lander**, **go-to-rock-1**, **go-to-rock2**, and **go-to-rock3**.

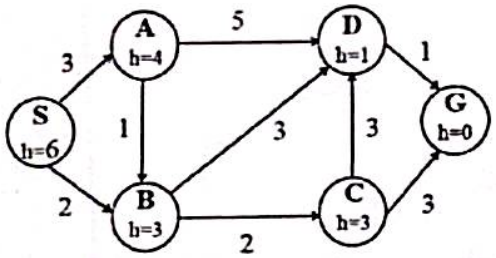
We know the time it takes to traverse between each pair of special locations. Our goal is to find a sequence of actions that will perform this task in the shortest amount of time.

I. Formulate this problem as a search problem by specifying the state space, initial state, actions, transition model, path-cost function, and goal test.

II. Explain which search technique would be most appropriate to solve this problem, and why?

5. [ 5+5=10 Marks ]

a) Consider the graph given below. Assume that **S** is the initial state and **G** is the goal state. The transition costs (or step costs) are next to the edges, and the heuristic values are indicated within round brackets very close to the states. Compare and apply i) UCS, and ii) A* algorithm to find the path and path-cost in each case. (Draw in each case the tree diagram.)




*** Best of Luck ***