



SPRING MAKE-UP 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: 20

Answer all four Questions.

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 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) Match the two columns A & B:

	A		B
A1	Example of Performance measure	B1	Rational agent
A2	Cognitive modeling approach	B2	Accelerator (Agent: Self-driven Car)
A3	Turing Test	B3	Laws of thought approach
A4	Example of Environment	B4	Accelerometer (Agent: Self-driven Car)
A5	Example of Sensor	B5	Human interrogator
A6	Logic	B6	Pedestrian (Agent: Self-driven Car)
A7	Example of Actuator	B7	Thinking like human
A8	More amenable to scientific development	B8	Legal drive (Agent: Self-driven Car)

c) What is the condition for optimality for Breadth-first search?

- A. When there is less number of nodes
- B. When all step costs are equal
- C. When all step costs are unequal
- D. When there is a looping path

d) Evaluate both heuristic values (h_1 = no. of misplaced tiles and h_2 = Manhattan distance) given the following initial state and final state of 8-puzzle problem.

Initial State

3	2	1
4	6	5
7	8	

Goal State

1	2	3
4		5
6	7	8

e) In A* search, what are Admissible heuristic and Consistent heuristic? Why is Consistent heuristic also known as triangle inequality?

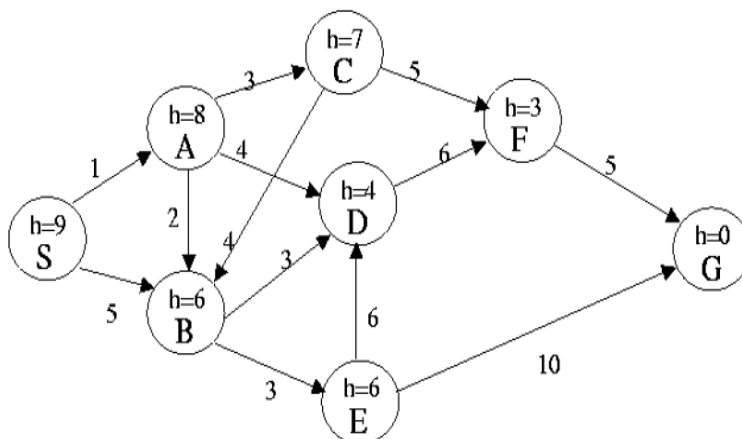
2. [2 Marks + 3 Marks]

a) Name the four approaches of AI. Why is Rational agent approach is superior to other three approaches? State at least five state of the art applications of AI.

b) Why is Table driven approach to agent construction is a failure? Explain a learning agent with suitable diagram. Describe its four conceptual components with an example for each of these components.

3. [3 Marks + 2 marks]

a) Consider the directed search graph below with start state **S** and goal state **G**. The transition costs (or step costs) are indicated next to the edges, and the heuristic values are indicated inside the nodes. Apply A* search to expand the nodes systematically by drawing the tree diagram. Find the path from **S** to **G** and corresponding path cost.



b) Mention six properties of a task environment. Specify the properties of these six environments for the following agents in a tabular manner:

A. Chess playing agent (with a clock)

B. Part-picking robot

4. [3 Marks + 2 Marks]

a) In the following 8-puzzle problem, initial and goal states are given:

Initial State

2	8	3
1	6	4
7		5

Goal State

1	2	3
8		4
7	6	5

Find the most cost-effective path to reach the final state from initial state using A* Algorithm.
[Consider the path cost of node n i.e. $g(n)$ = Depth of node n and heuristic value of node n i.e. $h(n)$ = Manhattan distance for node n..

b) Consider a binary search tree where the initial node is number 1 and each node k has two [2]
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 for
A) breadth first search (BFS), B) depth limited search (DLS) with Limit = 3 and
C) iterative deepening search (IDS).

*** Best of Luck ***