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: 20

Answer any four Questions including Q.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 x 5]

a) Explain Turing Test. Mention six capabilities that a computer should posses to qualify for Total Turing Test.

b) Match the two columns A & B:

	A		B
A1	Laws of thought approach	B1	Episodic environment
A2	Example of performance measure	B2	Cooperative multiagent environment
A3	Thinking like human	B3	Crossword puzzle
A4	Example of actuator	B4	High resolution digital camera (Satellite image analysis system)
A5	Two car driving agents avoiding collision on the road	B5	Cognitive modelling approach
A6	Example of sensor	B6	Tasty and less oily food (Cooking agent)
A7	Part-picking robot	B7	Thinking rationally
A8	Discrete environment	B8	Display of questions, tests, diagnoses, treatments (Medical diagnosis system)

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) Fill in the blanks:
    I)   The tree-search version of A* is optimal if h(n) is _____, while the graph-search version of A* is optimal if h(n) is _____.
    II)   The heuristic h(n) is consistent if h(n) <= h' (n) + c(n, a, n'). This is a form of the general _____ inequality.

e) In the following 8-puzzle problem, justify that Goal State is reachable from the given Initial State. Also calculate both the heuristics h1 (Number of misplaced tiles) and h2 (Manhattan distance).

Initial State

2	4	
6	1	8
7	3	5

Goal State

2	8	3
4	1	6
7	5	

2.a) For each of the following activities/ agent, give a PEAS description of the task environment   [3]
         (i) Performing a high jump
         (ii) Medical diagnosis agent
         (iii) Soccer playing agent

b) (i) Differentiate between a Goal based agent and Utility based agent   [0.5 + 1.5]

(ii) Draw a Learning agent and explain briefly its four conceptual components through suitable example(s).

3. a) What are the components of problem formulation for a problem-solving agent.   [2]
Formulate each of the following problems by stating these components:

(i) 8-puzzle (sliding tile) problem

(ii) 8-queen proble

b) (i) From where do uninformed search strategies use the information? Describe   [1.5 + 1.5]
any one uninformed search with its algorithm.

(ii) Explain briefly different environment types for AI-based agents. How are these types of environments shared in an Automated taxi driver agent?

4. a) In the following 8-puzzle problem, initial and goal states are given: [3]

Initial State

2		3
1	8	4
7	6	5

Goal State

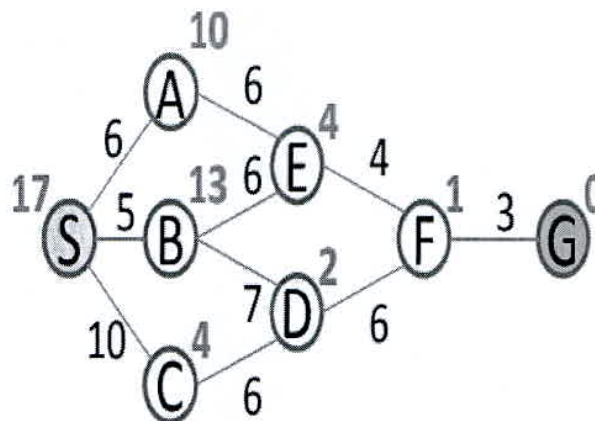| 1	2	3
8		4
7	6	5

Find the path to reach the Goal State from the Initial State using A* Search algorithm. Also, what is the path cost for this path?

[Consider the path cost of node n i.e. $g(n)$ = Depth of node n and heuristic value of node n i.e. $h(n)$ = Number of misplaced tiles.]

b) In a search tree, given b (branching factor) = 10 and d (depth of   [2]

shallowest goal node) = 5, show that the number of nodes generated for IDS (i.e. N_{IDS}) is greater than that generated for BFS (i.e. N_{BFS}). Justify why then still IDS is considered to be a superior uninformed search strategy.

5.In the following search problem, S is the initial node and G is the goal node.   [1.5 +1.5 +2]
The transition cost (i.e. step cost) is mentioned on the edge. The heuristic value of each node is mentioned on top of the concerned node. Find the path from S to G and evaluate the path cost using each of the following search strategies by showing the tree formation in each case:

I) Uniform Cost Search (UCS)

II)Greedy Best First Search

III)   A* Search

*** Best of Luck ***