Candidate Seat No._____

CHAROTAR UNIVERSITY OF SCIENCE & TECHNOLOGY

Fifth Semester of B. Tech. Examination (IT)

November 2022

IT381: Artificial Intelligence

Date: 29.11.2022, Tuesday **Time: 10:00 am To 01:00 pm** **Maximum Marks: 70**

Instructions:

1. The question paper comprises of two sections.
2. Section I and II must be attempted in separate answer sheets.
3. Make suitable assumptions and draw neat figures wherever required.
4. Use of a scientific calculator is allowed.

SECTION – I

Q - 1 Choose any one from multiple options. **[05]**

(a) What is the main aim of Artificial Intelligence? **[01]**

1. To solve real-world issues
2. To explain different sorts of intelligence
3. To solve artificial problems
4. To obtain information about scientific causes

(b) Which search is implemented with an empty first-in-first-out queue? **[01]**

1. Depth-first search
2. Breadth-first search
3. Bidirectional search
4. None of the mentioned

(c) What is state space? **[01]**

1. The whole problem
2. Your Definition to a problem
3. Problem you design
4. Representing your problem with variable and parameter

(d) Which of the following is not a property of representation of knowledge? **[01]**

1. Representational Verification
2. Representational Adequacy
3. Inferential Adequacy
4. Inferential Efficiency
5. None of the mentioned

(e) Suppose the predicate F (x, y, t) is used to represent the statement that person x can fool person y at time t. which one of the statements below expresses best the meaning of the formula $\forall x \exists y \exists t (\neg F(x, y, t))$? **[01]**

1. Everyone can fool some person at some time
2. Everyone cannot fool some person all the time
3. No one can fool everyone all the time
4. No one can fool some person at some time

[15]

Q - 2 Write the answer to the following questions.

(a) Give comparisons between Strong AI and Weak AI. [02]

(b) Explain the Turing Test and list the features that a machine must have in order to pass it. [03]

OR

(b) Define Artificial Intelligence. List the task domains of AI problems. [03]

(c) You are given two jugs, a 3-gallon one and a 5-gallon one, a pump which has unlimited water which you can use to fill the jug, and the ground on which water may be poured. Neither jug has any measuring markings on it. How can you get exactly 4 gallons of water in one of the jugs? Write down State Space Representation, Assumptions, Rules and Solution. [05]

OR

(c) Discuss the seven problem characteristics with respect to the travelling salesman problem. [05]

(d) What is meant by "control strategy"? State the requirements of a good control strategy. [02]

(e) Discuss the different approaches to knowledge representation. [03]

Q - 3 Write the answer to the following questions. [15]

(a) Solve the following 8-puzzle problem using hill climbing algorithm. [05]

The heuristic function to be used is set-up as h (n) = the number of misplaced tiles (excluding the blank tile).

1) Show all possible moves at each iteration of hill climbing algorithm.
2) Show the best move after each iteration of hill climbing algorithm.
3) State number of steps required to solve the puzzle (i.e. Reaching global minimum)

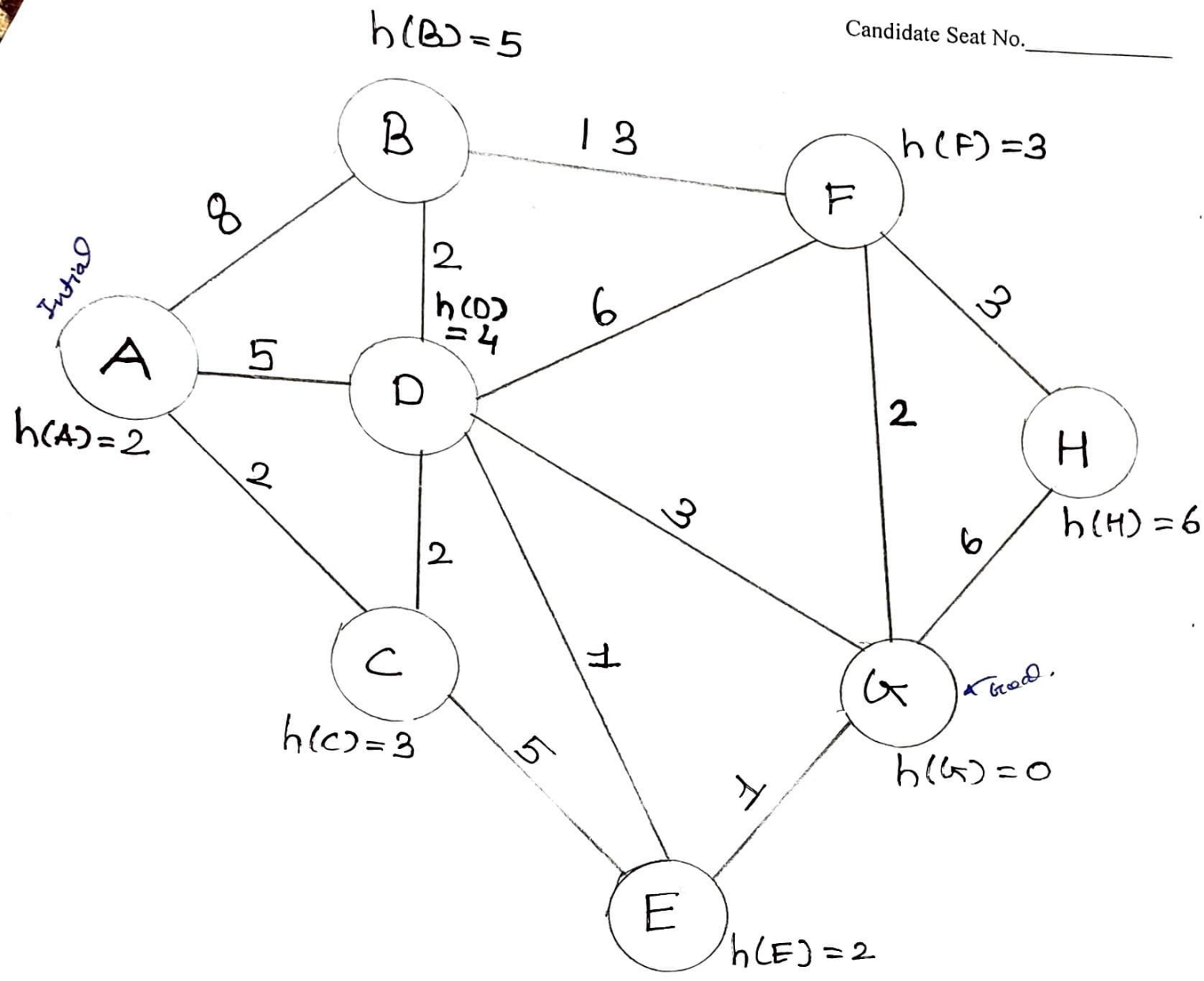
1	2	3
7	8	4
6		5

Initial State

1	2	3
8		4
7	6	5

Goal State

(b) Perform the A* Algorithm on the following figure. Explicitly write down the queue at each step. Find a path between A and G in the following graph. The number attached to each edge in the graph represents the COST of traversing the edge. The number h associated with each node represents a heuristic under-estimate of the distance of the node to the goal G. [05]



(c) Solve the crypt arithmetic problem using the constraint satisfaction procedure. **[05]**

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  P O I N T
+   Z E R O
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E N E R G Y
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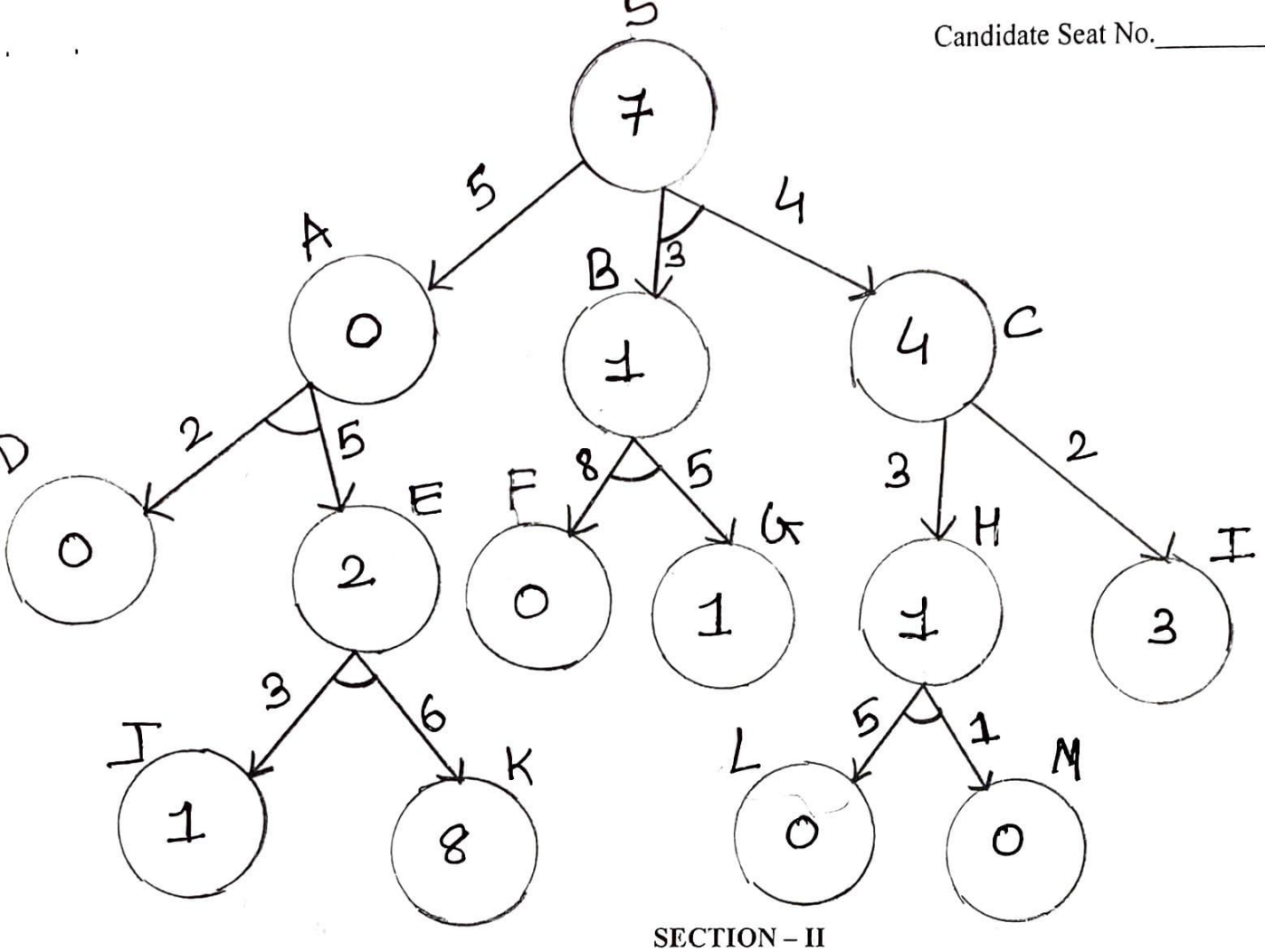
OR

(c) Figure below depicts the AO* algorithm working on a problem. The nodes are labelled with their heuristic values. The cost of each edge is given in the figure. Which of the following node(s), identified by their heuristic value, could the algorithm expand/refine next? Traverse the complete graph, update the heuristic value as required to find out the most promising route. **[05]**



SECTION – II

Q - 4 Write the answer to the following questions. [05]

(a) How is Fuzzy Logic different from conventional control methods? [01]

1. IF and THEN Approach
2. FOR Approach
3. WHILE Approach
4. DO Approach

(b) Which algorithm will work backward from the goal to solve a problem? [01]

1. Forward chaining
2. Backward chaining
3. Hill-climb algorithm
4. None of the mentioned

(c) NLTK Stands for _____. [01]

1. Numerical Level toolkit.
2. Nural Language Toolkit
3. Natural Language Toolkit
4. None of these

(d) _____ is the process of tokenizing or splitting a string, text into a list of tokens. [01]

1. Rooting
2. Chunking
3. Steaming
4. Tokenization

(e) Graph used to represent semantic network is _____ [01]

1. Undirected graph
2. Directed graph
3. Directed Acyclic graph (DAG)
4. Directed complete graph

Q - 5 Write the answer to the following questions. [15]

(a) Represent the following sentences in first-order logic. [05]

1) If Barbara practices she will win.
2) All grass is green.
3) There is a winning combination.
4) Some coins are round.
5) Every gardener likes the sun.

OR

(a) [05]

1) Fido is a dog
2) All dogs are animals
3) All animals will die

Use resolution and prove: Fido will die.

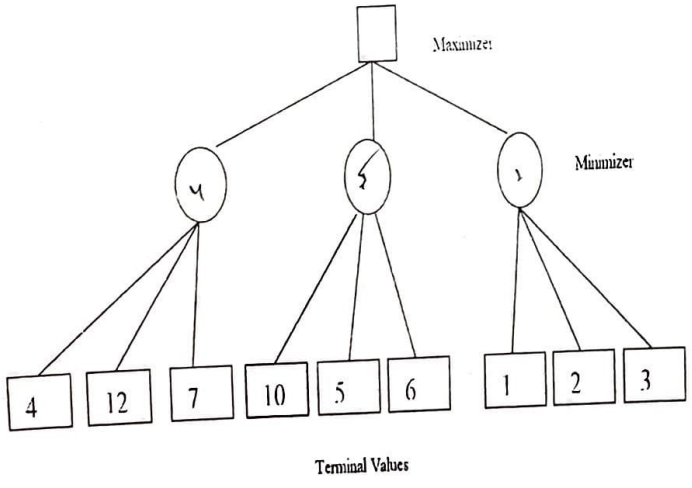
(b) Draw the semantic network structure for the following: [04]

Mouse is a Rodent and Rodent is a mammal.
Mouse has teeth and eats grass.

(c) Draw the partitioned semantic network structure for the following: [03]

All Monkeys are eating an apple.

(d) Consider the following minimax game tree search. What will be the value propagated at root? [03]



Terminal Values

Q - 6 Write the answer to the following questions. [15]

(a) Explain the various components of the Natural Language Understanding process. [05]

(b) List out the property of Monotonic and Non monotonic reasoning. **[05]**

OR

(b) Explain Mutation and Crossover in Genetic Algorithm. **[05]**

(c) How is Fuzzy logic different than Crisp logic? What is the importance of the membership function? **[05]**
