Reg. No: 22BIT053

C/L/TX

Final Assessment Test – November 2024

VIT Vellore Institute of Technology

Course: BITE308L - Artificial Intelligence

Class NBR(s): 3399/3402 / 3407 / 3467

Slot: D1+TD1

Time: Three Hours

Max. Marks: 100

- KEEPING MOBILE PHONE/ANY ELECTRONIC GADGETS EVEN IN 'OFF' POSITION IS TREATED AS EXAM MALPRACTICE
- DON'T WRITE ANYTHING ON THE QUESTION PAPER

Answer ALL Questions

(10 X 10 = 100 Marks)

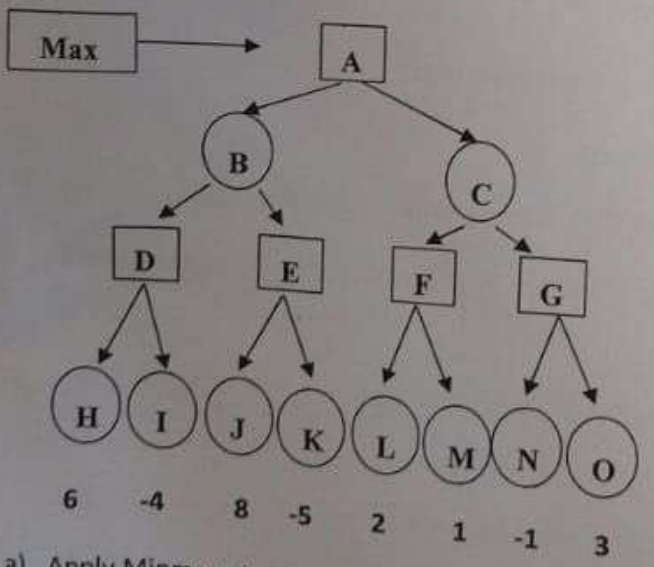
1. a) Define in your own words the following terms: [6]

   Intelligent agent, Production system, State space

   b) For the given agent types specify PEAS description and properties of Environment description: [4]

   Taxi driving, Part picking robot

2. Given the following search tree,



   a) Apply Minmax algorithm.

   b) Apply the alpha-beta pruning algorithm to it and show the search tree that would be built by this algorithm. Make sure that you show where the alpha and beta cuts are applied, and which parts of the search tree are pruned as a result.

3. Represent the following knowledge in a semantic network.

Dogs are Mammals. Birds have Wings. Mammals are Animals. Bats have Wings. Birds are Animals. Bats are Mammals. Fish are Animals. Dogs chase Cats. Worms are Animals. Cats eat Fish. Cats are Mammals. Birds eat worms. Cats have Fur. Fish eat Worms. Dogs have Fur.

Suppose you learn that Tom is a cat.

What additional knowledge about Tom can be derived from your representation?

Suppose Tom is unlike most cats and doesn't eat fish. How could one deal with this in the semantic network?

4. Consider the following facts.

Anyone passing the Math exams and winning the lottery is happy.

Anyone who studies or is lucky can pass all his exams.

John did not study but he is lucky.

Anyone who is lucky wins the lottery.

a) Represent these sentences in first order logic (FOL) [5]

b) Convert those FOLs into clausal form [5]

5. a) From the above question, prove that "John is happy" using resolution. [5]

b) Show that $P \leftrightarrow Q$ is logically equivalent to $(P \vee Q) \rightarrow (P \wedge Q)$ using a truth table. [5]

6. a) Explain conditional probability by an example. Derive Bayes' rule for conditional probability. [5]

b) Two different suppliers, A and B, provide a manufacturer with the same part. All supplies of this part are kept in a large bin. In the past, 5% of the parts supplied by A and 9% of the parts supplied by B have been defective. A supplies four times as many parts as B. Suppose you reach into the bin and select a part, and find it is non- defective. What is the probability that it was supplied by A? [5]

7. A monkey is in a lab. The monkey wants some bananas. There are three locations in the lab – locations A, B and C. The monkey is at location A. There is a box in location C. There are some bananas in location B, but they are hanging from the ceiling. The monkey needs the box to get to the bananas.

a) Write down the initial state and goal state description using STRIPS language. [3]

b) Write down the STRIPS style definitions of the actions performed by the monkey in order to grab the bananas. [7]

8. Explain supervised, unsupervised and reinforcement learning techniques.

9.a) Consider the following set of facts, convert them to FOL and prove that "Marcus is dead" by applying **Forward chaining** algorithm.

Marcus was a man.
Marcus was a Pompeian.
Marcus was born in 40 A.D.
All men are mortal.
All Pompeian died when the volcano erupted in 79 A.D.
No mortal lives longer than 150 years.
It is now 2019.
Alive means not dead.
If someone dies, then he is dead at all later times.

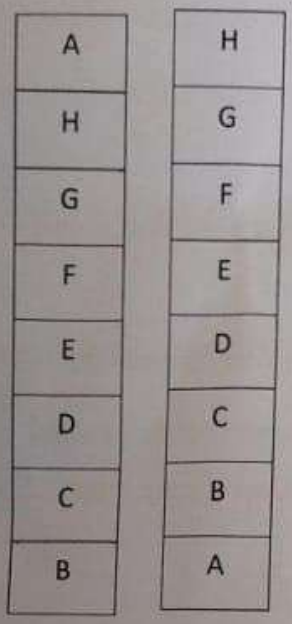
OR

9.b) Consider the following set of facts, convert them to FOL and prove that "Marcus is dead" by applying **Backward chaining** algorithm.

Marcus was a man.
Marcus was a Pompeian.
Marcus was born in 40 A.D.
All men are mortal.
All Pompeian died when the volcano erupted in 79 A.D.
No mortal lives longer than 150 years.
It is now 2019.
Alive means not dead.
If someone dies, then he is dead at all later times.

10.a) Explain the Hill climbing search. Solve the following blocks problem using Hill climbing algorithm:

Initial state: Goal state:



OR

10.b) Solve the following water jug problem using Breadth- First- Search (BFS) and Depth- First- Search (DFS) algorithms:

You are given two jugs, 4 litre one and 3 litre one. Neither has any measuring marks on it. There is a pump that can be used to fill the jugs with water. How can you get exactly 2 litres of water into the 4-litre jug?

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