M.Sc. Computer Science
MCSC-102: Artificial Intelligence
Unique Paper Code : 223411102
Semester I
April-2022 (OBE)
Year of Admission : 2021

Time: Three Hours **Max. Marks: 70**

Attempt any FOUR questions
All questions carry equal marks

1. What is a crptarithmetic problem? Define a cryptarthmetic problem formally and describe how this problem is related to constraint satisfaction problem.

   Solve the following cryptarithmetic problem systematically giving step by step explanation:

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   USA
+USSR
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PEACE
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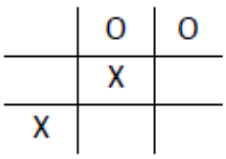
2.

a) Which of the following are true and which are false? Explain justifying your answer.

   (i) In a fully observable, turn-taking, zero-sum game between two perfectly rational players, it does not help the first player to know what strategy the second player is using, that is, what move the second player will make, given the first player's move.

   (ii) In a partially observable, turn-taking, zero-sum game between two perfectly rational players, it does not help the first player to know what move the second player will make, given the first player's move.

b) Select the next move for MAX player using minimax (putting an X) for the following state of the Tic-Tac-Toe game. Give systematic explanation of your answer.



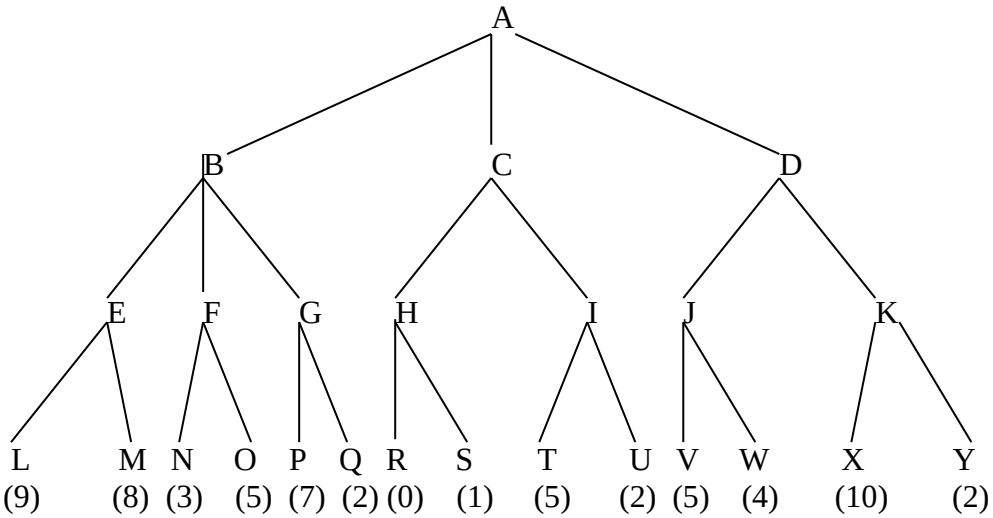
3.

a) Describe various types of knowledge representation techniques with the help of an example for each representation.

b) Explain (with the help of examples) that how and when
i) ! (cut)
ii) !, fail
are used in Prolog to change the backtracking sequencing.

c) What do you understand by α-β pruning? Under what circumstances, it is advantageous to use α-β pruning procedure?

Consider the following game tree in which the static scores are all from the first player's point of view.



If the first player is a maximizing player then what nodes would not be examined using α-β pruning procedure? Give step by step explanation of your solution.

4.

a) List and describe briefly various levels of Natural Language processing giving examples of each.

b) Determine whether each of the following sets is unifiable. If set is not unifiable, justify your answer and if set is unifiable, obtain a most general unifier.

i) w = { P(a, x, f(g(y))), P(z, f(z), f(u)))}
ii) w= {Knows(Mother(y), y),Knows(Father(x), x)}

c) For a triangle ABC, it is given that the sum of the interior angles: <A + <B + <C = 180 degrees. Represent the problem in predicate logic statements and show by resolution theorem that the exterior angle is the sum of the opposite interior angles.

5. A hungry monkey finds himself in a room in which a bunch of bananas is hanging from the ceiling. The monkey unfortunately, cannot reach the bananas. However, in the room there are also a chair and a stick. The ceiling is just the right height so that a monkey standing on a chair could knock the bananas down with the stick. The monkey knows how to move around, carry other things around, reach for the bananas, and wave a stick in the air. Formulate the problem giving clearly state descriptions and operators in first order logic. For each operator, you are required to define the name of the operator, preconditions, add list and delete list. Find the plan, i.e., sequence of actions which the Monkey should take to acquire lunch?

6. Differentiate between the following:
   a) Goal based agent and Utility based agent
   b) Hill climbing search and Iterative deepening search
   c) Best first search and Depth first search
   d) Knowledge based systems and Expert systems
   e) Substitution and Unification
   f) Semantics and Pragmatics
   g) Problem solving using Search and Problem solving using Planning