AI QUESTION BANK

Unit-1

What are the Problem Characteristics of Artificial Intelligence?

Solve Water Jug Problem using production rule system.

What is artificial intelligence? Define the different task domains of artificial intelligence.

How problem characteristics help in the selection of AI technique? Explain these characteristics with possible examples.

Explain Depth first search algorithm.

Explain state space representation using water jug problem.

Explain Best First Search method.

What is state space representation of a problem? Show the state space of the water jug problem.

Explain depth first search (DFS) and breadth first search (BFS) with suitable examples. Why is 'depth limited search' necessary in DFS?

Explain the State Space with the use of 8 Puzzle Problem.

What is production system? Explain it with an example. Discuss the characteristics of a production system.

Explain A* algorithm in detail.

Solve the following Crypt arithmetic problem:

C R O S S

+ R O A D S

D E N G E R

Given an example of a problem for which breadth-first search would work better than depth first search.

What is Hill Climbing? Explain Simple Hill Climbing and Steepest- Ascent Hill Climbing.

Solve Travelling Salesman Problem using any AI technique.

Explain AO* algorithm with an example.

Differentiate the DFS and BFS with merits and demerits.

Differentiate Hill climbing and Best First search method.

Explain mean-end analysis approach to solve AI problems.

What do you mean by admissibility of an algorithm? Is A* algorithm an admissible one? When?

Describe different heuristics for the Blocks world problem.

Discuss limitations of Hill climbing search method.

Discuss various issues in design of search program.

What is local maximum, Plateau and Ridge?

Describe different heuristics for the following types of problems:

    i. Blocks world   ii. Tic Tac Toe

Analyze following problems with respect to the 7 problem characteristics of AI.

    i. 8-puzzle   ii. Traveling salesman

Solve following cryptarithmetic problem with appropriate strategy/steps:

```
          E   A   T
   +  T   H   A   T
   _____
   A   P   P   L   E
```

Discuss hill climbing search method. Also discuss limitations and ways to overcome these limitations.

<div align="center">

OR

</div>

Discuss simulated annealing search method. Which types of problems are suitable to solve using this method?

Discuss A* algorithm. Give one example where it is suitable to apply.

Consider the following initial and goal configuration for 8-puzzle problem. Draw the search tree for initial three iterations of A* algorithm to reach from initial state to goal state. Assume suitable heuristic function for the same.

<div align="center">

Initial state   Goal state

</div>

	1	2
3	4	5
6	7	8

1	2	3
8		4
7	6	5

38.

Solve the following Cryptarithmetic Problem.

```
        B E S T
   +    M A D E
      _____
      M A S E R
```

Unit-2

1. Explain the algorithm of predicate logic resolution.
2. Differentiate between Procedural and Declarative representation of knowledge. Justify using an example that Prolog uses Backward chaining to prove or answer any given goal. Explain the procedure to convert well formed formula to clause form with the help of example.
3. Explain Resolution in predicate logic.
4. Discuss Cut, Repeat and Fail in Prolog.
5.

What is wrong with the following arguments?
- Men are widely distributed over the earth
- Socrates is a man.
- Therefore, Socrates is widely distributed over the earth.

How should the facts represented by these sentences be represented in logic so that this problem does not arise?

OR

Consider the following sentences:
- Raj likes all kinds of food.
- Apples are food.
- Anything anyone eats and isn't killed by is food.
- Sachin eats peanuts and is still alive.
- Vinod eats everything Sachin eats.

Now, attempt following:
  i.   Translate these sentences into formulas in predicate logic
  ii. Use resolution to answer the question, "What food does Vinod eat?"

6.

Consider following facts.
1. Every child loves Santa.
2. Every child loves every candy.
3. Anyone who loves some candy is not a nutrition fanatic.
4. Anyone who eats any pumpkin is a nutrition fanatic.
5. Anyone who buys any pumpkin either carves it or eats it.
6. John buys a pumpkin.
7. Lifesavers is a candy.

Use resolution and prove: If John is a child, then John carves some pumpkin.

OR

Describe following facts into predicate logic.
1. Every child loves Santa.
2. Everyone who loves Santa loves any reindeer.
3. Rudolph is a reindeer, and Rudolph has a red nose.
4. Anything which has a red nose is weird or is a clown.
5. No reindeer is a clown.
6. Scrooge does not love anything which is weird.

7. Write following prolog programs:

i. To find the factorial of a positive integer number.

ii. To find the nth element of a given list..

8.

Write a Prolog program for finding a set, which is result of the intersection of the two given sets.
Hint: Goal: intersect([1, 2, 3], [2, 3, 4], A)
        A = [2, 3]
        Goal: intersect([d, f, g], [a, b, c], X)
        X = []

OR

Write a Prolog program to merge two sequentially ordered (ascending) lists into one ordered list.
Hint: Goal: merge([1, 3, 5, 7], [0, 2, 4, 6], L)
       L = [0, 1, 2, 3, 4, 5, 6, 7]
       Goal: merge([a, c], [b, d], [a, b, c, d])
       Yes

8. Explain the steps of unification in predicate logic. Also discuss the steps of converting predicate logic wffs to clause form.
9. Explain following terms with reference to Prolog programming language: Clauses, Predicates, Domains, Goal, Cut, Fail, Inference engine.
10. Explain how list is used in Prolog. Discuss how following list-functions can be implemented in Prolog: Checking membership of an item in a given list, concatenating two lists, and deleting an item in a given list.
11.

Assume the following facts :
- John likes all kinds of food.
- Apples are food.
- Chicken is food.
- Anything anyone eats and isn't killed by is food.
- Bill eats peanuts and is still alive.
- Sue eats everything Bill eats.
- Translate these sentences into formulas in Predicate logic
- Prove that John likes peanuts using backward chaining.

12. What is Red Cut and Green Cut in Prolog? Demonstrate the use of Repeat Predicate in Prolog with example.
13.

Consider the following sentences:
- Prince is a mega star.
- Mega stars are rich.
- Rich people have fast cars.
- Fast cars consume a lot of petrol.

(1) Translate these sentences into formulas in predicate logic.
(2) Prove that Prince's car consumes a lot of petrol.

14.

Assume the following facts :
- Steve only likes easy courses.
- Science courses are hard.
- All the courses in the basketweaving department are easy.
- BK301 is a basketweaving course.

Use Resolution to answer the question, "What Course would Steve like?"

15. What is wrong with the following arguments?
- Men are widely distributed over the earth
- Socrates is a man.
- Therefore, Socrates is widely distributed over the earth.

How should the facts represented by these sentences be represented in logic so that this problem does not arise?

16. Write a prolog program to find sum of all the numbers of a list.
17. Write a prolog program to find maximum number from a list.
18. Write a Prolog program to find factorial of a given number. To find the nth element of a given list. To append List2 to List1 and bind the result to List3.
19. Write a prolog program to solve Tower of Hanoi Problem. Write a prolog program to reverse the given list.
20. Differentiate Monotonic and Non monotonic reasoning
21. Discuss how the following list function can be implemented in Prolog.
    1. Append 2. Reverse
22. Write a prolog program to find the sum of first N natural numbers.
23. What do you understand by the term Fuzzy Logic? How is a fuzzy set denoted mathematically?
24. What are the Applications, Features and Limitations of Prolog?
25. Compare Fuzzy Vs Crisp logic and their membership function
26. Explain how list is used in Prolog. Discuss how following list-functions can be implemented in Prolog:
(a) Checking membership of an element in a given list, (b) concatenating two lists, and (c) deleting an element from a given list.

27. What is difference between Fuzzy Logic and Probability? Explain with suitable example.

28. What is Fuzzification? How Defuzzification is differing from Fuzzification? Explain various techniques of Defuzzification with example.

29. Let X={a,b,c,d} Y={1,2,3,4}. A={(a,0),(b,0.8),(c,0.6),(d,1)} B={(1,0.2),(2,1),(3,0.8),(4,0)} C={(1,0),(2,0.4),(3,1),(4,0.8)}. Determine the implication relations: IF x is A THEN y is B ELSE y is C.

30. What is Fuzzy Inference system? Explain various steps to implement Fuzzy Inference System with example.

31. Let A={(x1,0.2),(x2,0.7),(x3,0.4)} and B={(y1,0.5),(y2,0.6)} , C={(z1,0.3),(z2,0.5),(z3,0.6)} be three fuzzy sets defined on the universe of discourse X, Y and Z respectively. Generate relations R, S resulting out of the fuzzy Cartesian product A×B and B×C respectively. After that yield R ° S by max-min composition.

Unit-3

1. Explain the different issues in Knowledge representation.
2. Justify using an example that Prolog uses Backward chaining to prove or answer any given goal.
3. Differentiate between declarative and procedural representation of knowledge.
4. Discuss the different approaches to knowledge representation.
5. Explain difference between forwards reasoning(chaining) and backward reasoning(chaining).
6. Explain property inheritance algorithm with example.

Unit-4

1. Explain non-monotonic reasoning in detail.
2. Explain different subtypes of non-monotonic reasoning in brief.
3. Explain monotonic reasoning in detail.
4. Define 'certainty factor'. How does certainty factor help in dealing with uncertainty? Explain with reference to rule based system.
5. Explain abductive reasoning using example.
6. Explain the Bayesian Networks in detail.
7. Explain Probability and Bay's Theorem.

Unit-5
1. Discuss Alpha-Beta cutoffs procedure in game playing. State a case when to do alpha pruning.
2. Write a short note on Semantic Net.
3. Discuss Goal Stack Planning
4. Explain Min Max procedure in game playing.
5. Draw Semantic Net for following statements.
    a) Every kid likes candy.
    b) Every school going kid likes candy.
6. Define Scripts. Write conceptual dependency for following statements.
    a) John flew to New York.
    b) John shot Mary.
    c) John ate eggs.
7. Explain example of partitioned Semantic Net.
8. What is Semantic Nets? Consider the following statements and draw the semantic net:

Tom is a cat.

Tom caught a bird.

Tom is owned by John.

Tom is ginger in colour.

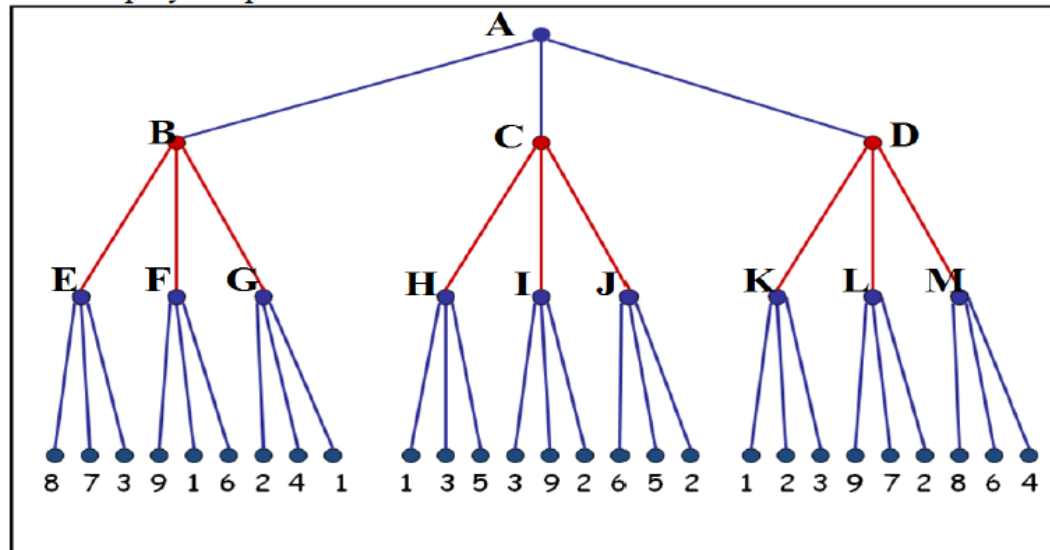Cats like cream. The cat sat on the mat.

A cat is a mammal. A bird is an animal.

All mammals are animals.

Mammals have fur.

9. Construct the partitioned semantic net representations for the following:
    • Every batter hit a ball.
   • All the batters like the pitcher.
10.

(a) Consider the following 2 player game tree in which static scores are given from the first player's point of view:

Suppose the first player is the maximizing player. What move should be chosen? Why? Use Mini-Max search to solve.

Also explain limitations of Mini-Max search. How to overcome them?

11. Represent following sentence using semantic net: `Sita gave the pearl garland to Hanuman.'

12. Consider the game tree of Fig. in which the static scores are from first player's point of view. Suppose the first player is maximizing player. Applying mini-max search, show the backed-up values in the tree. What move will the MAX choose? If the nodes are expanded from left to right, what nodes would not be visited using alpha-beta pruning.
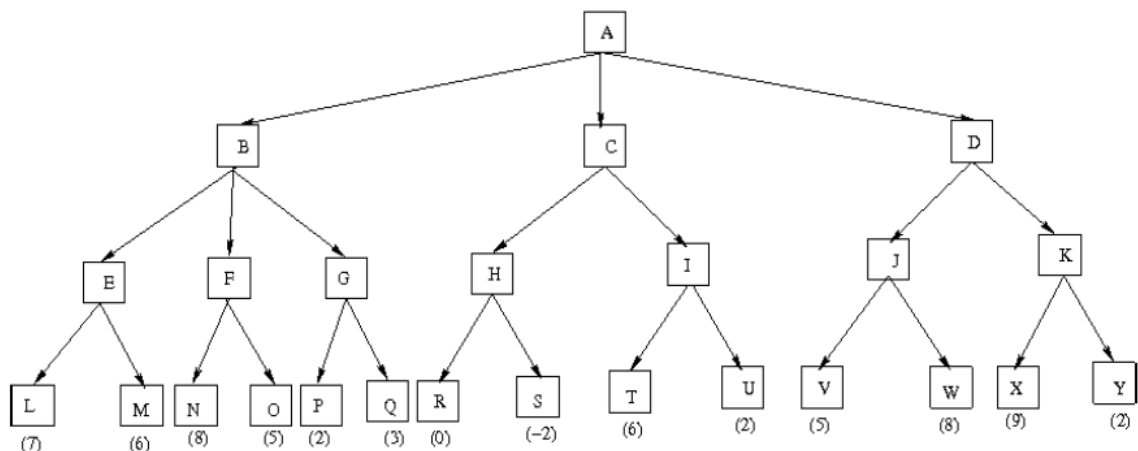
13.

We have two players: MIN who plays first and can make 4 moves, MAX who plays second and can make 2 moves. Suppose that after 1 turn, the values of the leaves are as in the figure :
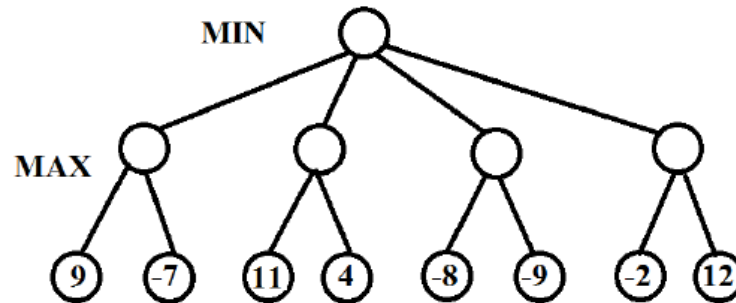
Compute (with the algorithm minimax) the value of the root of the tree, than say which is the most convenient move for MIN. Then tell with the reason, which parts of the tree are not generated if we perform an alpha-beta pruning.

Unit-6

1. Explain Semantic and Syntactic analysis in NLP.
2. List and explain the application of neural network.
3. Differentiate Supervised and Unsupervised learning.
4. Explain steps of Natural Language Processing.
5. What is Hopfield network?
6. Discuss algorithm for perceptron learning. What are the limitations of this algorithm?
7. Discuss Iterative Deepening Search. Also give one example to explain.
8. Explain connectionist models. What is perceptron? What is concept of back propagation for ANNs?
9. Enlist the phases of natural language understanding. Describe the role of each phase in brief.
10. List various components of natural language understanding process. Describe syntactic analysis and semantic analysis in brief.
11. Write a short note on: Recurrent Networks
12. Discuss different activation functions.
13. Explain Artificial Neural Network.
14. Explain backpropagation algorithm.

Unit-7

1. What is an expert system? Explain Architecture of an Expert system.
2. Describe Expert System development procedure.
3. Explain followings with reference to expert system:

(i) Expert system shell

(ii) Knowledge acquisition

4. Explain Genetic Algorithms.

5. Define terms:

Encoding

Fitness Function

Crossover

Mutation