

Question Bank

Artificial Intelligence

UNIT - I

Introduction to Artificial Intelligence

- 1) What is AI? (2m)
- 2) State any 2 Applications of AI. (2m)
- 3) What is an AI technique? Describe characteristics of an AI technique giving examples.
- 4) State some of the less desirable properties of "*Knowledge*".
- 5) Differentiate between knowledge and data
- 6) State any 2 AI techniques.
- 7) What is an AI technique? Describe characteristics of an AI technique giving examples. (3)

UNIT - II

Problems, Problem Spaces and Search

- 1) Differentiate between informed and uninformed searches (2m)
- 2) State the 4 components using which a problem can be well formulated formally (4m)
- 3) State the measures that evaluate an algorithms performance. (2m)
- 4) Write a short note on Production systems
- 5) Explain the DFS search. State its disadvantage
- 6) Explain the BFS search. State its disadvantage
- 7) Define search strategy. (2m)
- 8) How is time and space complexity measured in searches? (2m)
- 9) In BFS/DFS, how can we avoid the possibility of wasting time by expanding the states that have already been encountered and expanded before? (2m)

CASE STUDIES: 5m : Additional Problems

1) The following is a problem, which can be solved using state-space search techniques: "A farmer with his dog, rabbit and lettuce come to the east side of a river they wish to cross. There is a boat at the river's edge, but of course only the farmer can row. The boat can only hold two things (including the rower) at any one time. If the dog is ever left alone with the rabbit, the dog will eat it. Similarly if the rabbit is ever left alone with the lettuce, the rabbit will eat it. How can the farmer get across the river so that all four characters arrive safely on the other side?"

Formalize the above problem in terms of state-space search. You should:

- a) Suggest a suitable representation for the problem state.
- b) State what the initial and final states are in this representation.
- c) State the available operators/rules for getting from one state to the next, giving any conditions on when they may be applied.

2) 8-/ 15- Puzzle

3) Crypt arithmetic problems

For example

Given the following equation

$$\begin{array}{r} \text{SEND} \\ + \text{MORE} \\ = \text{MONEY} \end{array}$$

The aim is to assign each letter a unique integer in the range 0..9 so that the sum is correct. Define the problem as a constraint satisfaction problem (CSP) in terms of variables, V, domains, D and constraints, C. Show how an analysis of the problem can be used to reduce the domains of the variables and create additional constraints.

Unit 3. Heuristic Search Techniques

1. State any 4 heuristic search techniques (2m)
2. Explain the Generate-and-test strategy of problem solving. (4m)
3. Explain the pros and cons of the Generate-and-test strategy (2m)
4. What is the British Museum Algorithm? (2m)
5. State the method to implement generate-&-test. (2m)
6. How is Plan-generate-test different from generate-&-test strategy? (2m)
7. What is Hill climbing strategy? (2m)
8. How is Hill climbing strategy different from Generate-&-test strategy? (2m)
9. Define absolute and relative solutions. (2m - 4 m)
10. State the algorithm for Simple Hill Climbing. How is it different from Generate-&-test algo? (4m)
11. Explain the Steepest-Ascent hill climbing or Gradient search (4m)
12. Justify/Comment. The Hill climbing algo and the steepest-ascent algo are not complete. (2m)
- or
- 12) Justify/Comment. The Hill climbing algo and the steepest-ascent algo may fail to find a solution. (2m)
- 13) Define a local maximum, a plateau, a ridge (any one 2m each)
- 14) How can one deal with avoiding landing up at local maxima? (2m)
- 15) How can one deal with avoiding landing up at a ridge? (2m)
- 16) How can one deal with avoiding landing up at a plateau? (2m)
- 17) Compare and contrast Depth First Search and Breadth First Search method. (2)
- 18) Describe Hill-climbing search method. What the problems in this method and how to overcome them? (3)
- 19) How does a control strategy differ with topology of the search problem? Explain giving examples. (2)
- 20) What is heuristics? Describe ways of incorporating heuristic information in an application with examples. (4)
- 21) Explain with examples what will happen with h' –
 - i) Overestimates h
 - ii) Underestimates h

In A* algorithm. (4)

22) Consider the 8-puzzle problem. This is a simple sliding tile puzzle on a 3*3 grid where one tile is missing and you can move the other tiles into the gap until you get the puzzle into the goal position. Take following positions of 8-puzzle as start and goal states.

Start state	blank	A	C
	H	B	D
	E	F	E
Goal state	A	B	C
	H	blank	D
	G	F	E

- Find the appropriate “Estimate of heuristic (h’) function” for this problem. (2)
- State the appropriate g (cost of coming to a particular node from initial state) function. (1)
- Draw the entire search tree for this problem using A* algorithm showing the solution from initial state to final state. Also show the OPEN LIST, CLOSED LIST, BEST NODE, CLOSED OLD for each step in tabular format. (5)
- Explain how function g (cost of coming to a particular node from initial state) plays an important role in guiding the search in this example. (1)

23) Discuss any three search methods used to navigate through the search tree. Explain advantages and disadvantages of these methods. (5)

24) What is best-first search? Explain how it is implemented in A* and AO* algorithms giving examples. (5)

25. Explain the Simulated Annealing algorithm. (4m)

26. Explain the Best-first Search strategy. State the significance of OR graph in Best-first search. (4m)

27. Explain the A* algorithm. (4m)

28. Explain the AO* algorithm. (4m)

29. What are AND-OR Graphs (2m)

30. What is constraint satisfaction? (2m)

31. What is means-ends analysis? (2m)

32. Explain the means-ends algorithm (4m)

33. Differentiate between forward Vs backward reasoning. (4m)

Unit IV

Knowledge Representation

Topics: Representations and Mappings, Approaches to Knowledge Representation, Knowledge representation method, Propositional Logic, Predicate logic, Representing Simple

facts in Logic, Representing Instances and Isa relationships, Computable Functions and Predicates, Resolution, Forward and backward chaining

1. What are facts? (2m)
2. A good system for the representation of knowledge in a particular domain is a must in an AI problem. State the properties that such a system must possess. (2m)
3. State the various methods of representing knowledge. (2m)
4. Describe any 2 methods of representing knowledge
5. What are computable functions and predicates? Explain with the help of examples.
6. What is resolution? (2m)
7. Explain the Algorithm to convert a wff to clausal form
8. Describe the resolution algorithm in predicate logic
9. Describe the unification algorithm

10. Problems in FOPL. (4-5m)

a) Ramu is a soldier. Ramu is a resident of Madras. Madras is in India. All Indian soldiers know Hindi.

Convert them into predicate form. Resolve to answer the question - Does Ramu know Hindi? What additional information is needed to answer the question?

b) Translate following sentences into WFFs in predicate logic.

- i) Sohan likes all kinds of food.
- ii) Apples are food. Chicken is food.
- iii) Anything anyone eats and is not killed by is food.
- iv) Ritesh eats peanuts and is still alive.
- v) Nita eats everything Ritesh eats.

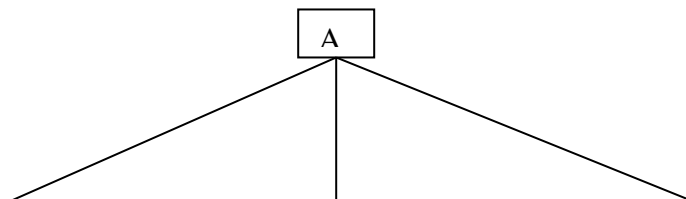
c) Assume the following facts:

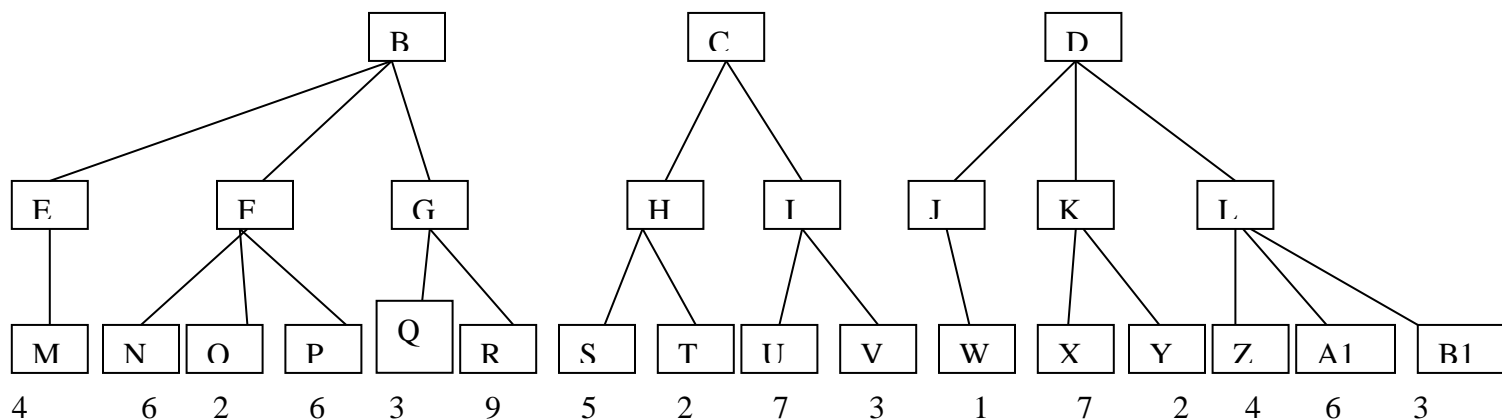
- vi) Gagan only likes easy courses.
- vii) Science courses are hard.
- viii) All the courses in Hindi department are easy.
- ix) H401 is a Hindi course.

Use resolution to answer the question “What course would Gagan like”?

Game Playing

- 1) Explain the min-max Algorithm. (4m)
- 2) Problem solving using the min-max algo. (4m)
- 3) Diff between alpha-beta search & min-max search (2m) (Norvig pg 185)
- 4) Explain the alpha-beta Algorithm. (4m)
- 5) Consider following 3-players game tree for players A, B, C.

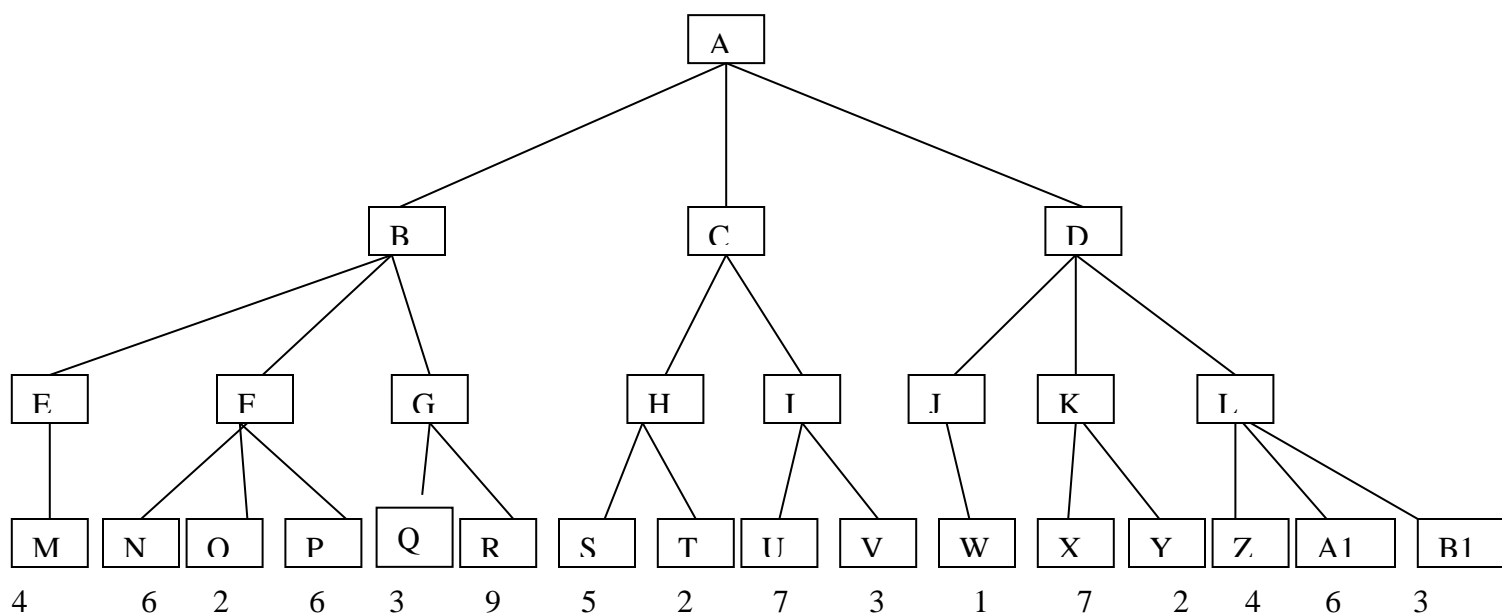




Using the Minimax algorithm -

- Find the next move Player A should take. (1)
- Show the value of EVAL function at each node. (2)
- Show the order of evaluation of nodes. (2)

5) Consider following 2-players game tree for players A, B.

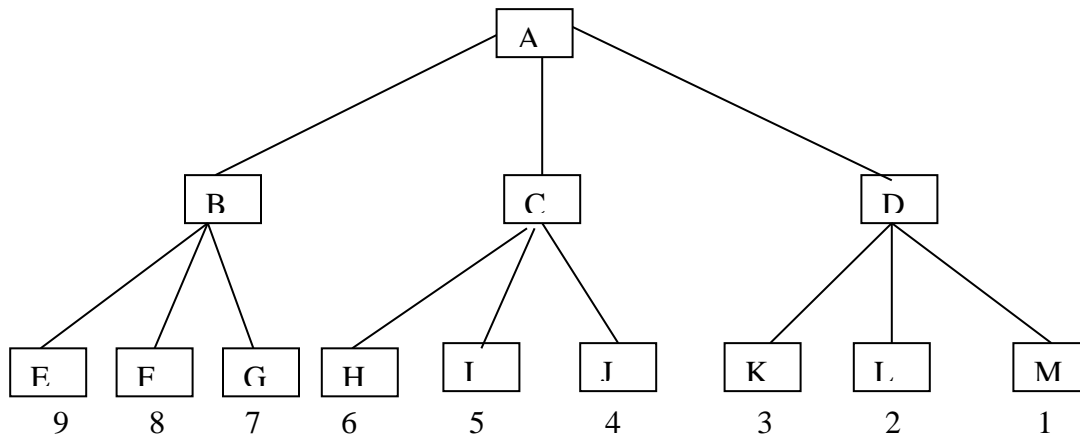


Using the Minimax algorithm with alpha-beta cutoffs -

- Find the next move Player A should take. (1)
- Show the alpha and beta values at every step. (2)
- Show the order of evaluation of nodes and state any of the pruning done because of alpha-beta cutoffs with type of cutoff and the cutoff value. (2)

6) Discuss the problems in Minimax algorithm with alpha-beta cutoffs. Explain with examples how they can be overcome? (4)

- 7) Consider the following 2-player game tree Player 1 and Player 2. It is Player 1's turn to make a move in the game.



- (a) Using the “Minimax” algorithm -
- Find the next move Player 1 should take. (1)
 - Draw the game tree with Maximizing and minimizing plies showing the EVAL function values at each node. (2)
 - Show the order of evaluation of nodes. (2)
- (b) Using the “Minimax with Alpha-beta cutoff” algorithm -
- Draw the game tree with Maximizing and minimizing plies showing the EVAL function values at each node. Also show the alpha/ beta values at each node. (2)
 - Show the order of evaluation of nodes and state any of the pruning done because of alpha-beta cutoffs with type of cutoff and the cutoff value. (3)

Unit V Python and Machine Learning

- 1) Explain the features of Pandas libraries in Python
- 2) Write a short note on Python Dictionaries.
- 3) Write a short note on Python Tuples
- 4) Write a short note on Python list.
- 5) Write a short note on Python sets.
- 6) Define machine learning.
- 7) Give advantages of Numpy array over python list.
- 8) Explain the KNN algorithm with an example.
- 9) Differentiate the classification model and regression model of machine learning with suitable examples.
- 10) Write a note on the Random Forest algorithm
- 11) List out the steps of data preprocessing in Machine Learning
- 12) Differentiate Supervised and unsupervised learning.

