Artificial Intelligence Question Bank
Unit-I

1. Describe the history and applications of AI.
2. Definition of AI, Agent, Rational Agent.
3. What are PEAS? Why it is used for?
4. Describe briefly the types of Agents.
5. What is Entailment?
6. Explain the Properties of A* Algorithm?
7. Illustrate Iterative Deepening search algorithm with a suitable Example.
8. Differentiate the properties of various blind or uninformed search algorithms.
9. What is Turing Test?
10. Consider a 1-dimensional sliding block puzzle with the following initial configuration:
 |B|B|B|W|W|W|E|
    There are three black tiles (B), three white tiles (W) and an empty cell (E). The puzzle has the following moves:
    - A tile may move to an adjacent empty cell with cost 1.
    - A tile may hop over one tile into an empty cell with a cost 2.
    The goal of the puzzle is to have all of the white tiles to the left of all the black tiles

    (a) Exhibit the first 4 nodes that will be expanded by DFS and BFS. (Assume arbitrary order of children for each node.)
    (b) For each black tile (B), assign a value 1 if there is at least 1 white tile (W) to its right, 0 otherwise. For each white tile (W), assign a value 1 if there is at least 1 black tile (B) to its left, 0 otherwise. Define a function h(n) as the sum over the assigned values for all tiles. What is the value of h(root)? What is the value of h(goal) for all the goal nodes? Also write h value for nodes expanded in step a)

11. The figure below represents the search space of a problem. Nodes are labeled with a letter and the value of a heuristic function h for the node. Edges are labeled with the cost of traversing the edge.
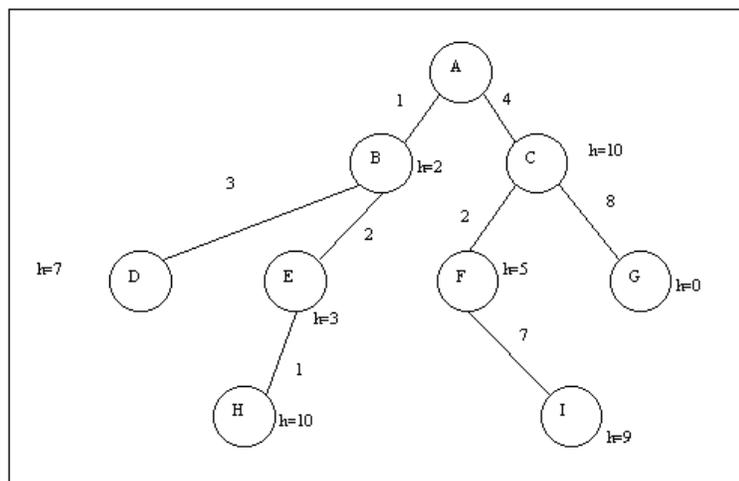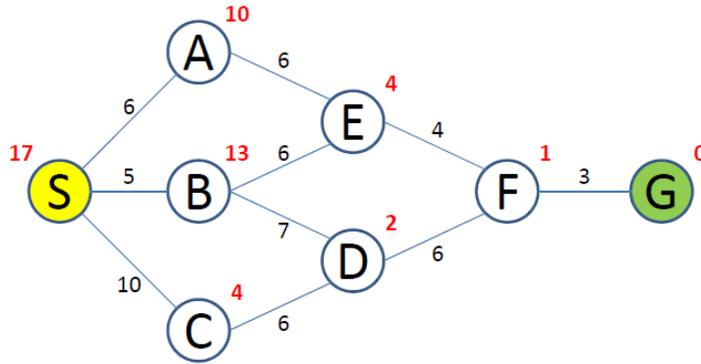

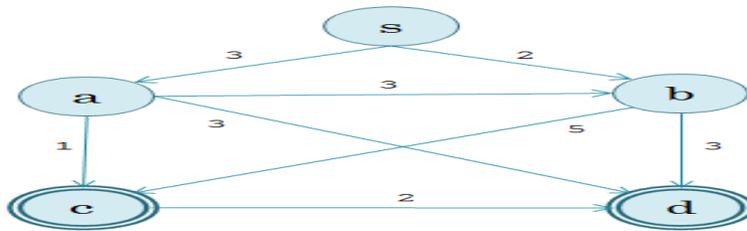
Explain and simulate the following algorithms

- Best First Search

12. Explain and simulate A* algorithm on the graph. For the solution found by A*, give the cost and sequence of
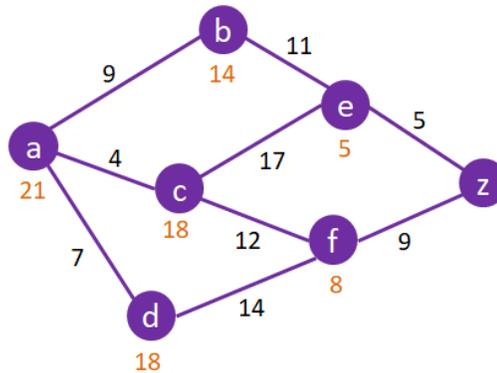nodes comprising the path.
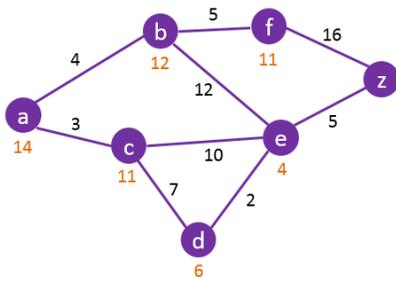
a)

b)

h(s)	h(a)	h(b)	h(c)	h(d)
1	3	3	0	0

c)

Apply the steps of the A* Search algorithm to find the shortest path from A to Z using the following
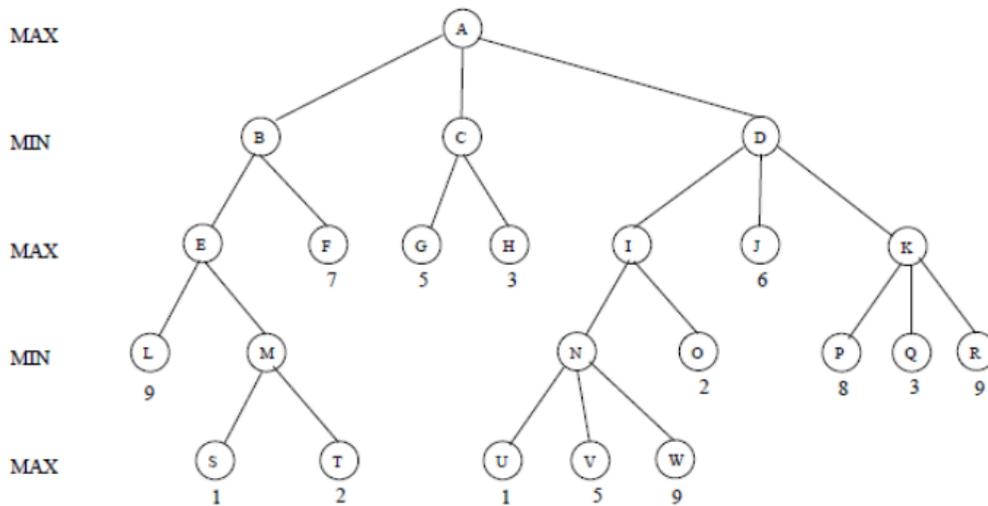

d)

13. Illustrate MIN MAX algorithm and static evaluation function for Tic-Tac-Toe example
14. Consider this game tree where the root is a maximizing node, and children are visited left to right.

i)

ii)
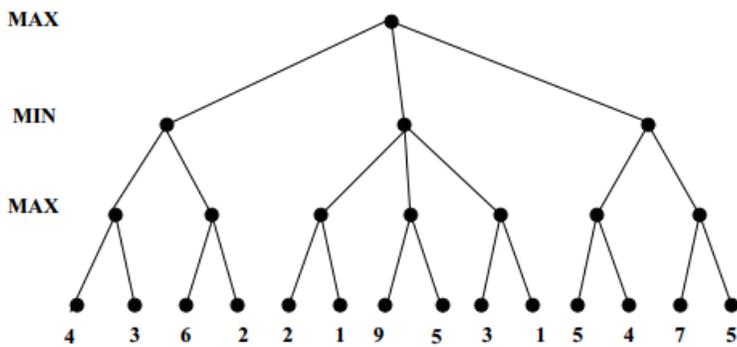
(a) Compute the minmax game value of each node using the standard minmax algorithm.
(b) What move will be selected by player one using minmax.
(c) List the nodes (leaves or interior nodes) that alpha-beta algorithm prunes, i.e., decides need not be examined

Unit II

15. What is prepositional calculus? Explain the deduction rules in the following
    a. Truth table
    b. Resolution
    c. Resolution refutation

16. Show the following:
    a. (A━B)━(A ━B) is valid using truth table
    b. ((A ∩ ~B)━ C) is logically equivalent to ~(A ∩ ~B ∩ ~C) using truth table

17. Let's consider a propositional language where
    • P means "Paola is happy",
    • Q means "Paola paints a picture",
    • R means "Renzo is happy".
    Formalize the following sentences:
    1. "If Paola is happy and paints a picture then Renzo isn't happy"
    2. "If Paola is happy, then she paints a picture"
    3. "Paola is happy only if she paints a picture

18. Use propositional resolution to show if the following sets of clauses are unsatisfiable
    (a) $\{p,q\}, \{\neg p,r\}, \{\neg p,\neg r\},\{p, \neg q\}$
    (b) $\{p,q, \neg r,s\}, \{\neg p,r,s\}, \{\neg q, \neg r\}, \{p, \neg s\}, \{\neg p, \neg r\}, \{r\}$

19. Show the following using resolution refutation

    i. $\{A \wedge B, \sim A \vee C\} \models B \vee C$
    ii. $\{A, B \rightarrow C, A \rightarrow C\} \models A \wedge C$
    iii. $\{A \rightarrow B \wedge C, A\} \models C$
    iv. $\{A \vee C, \sim B \vee \sim C \} \models A \vee \sim B$

20. What are quantifies? When they are used? Illustrate with suitable examples.
21. What is predicate calculus? Explain resolution with an example.
    b) Convert the following into FOL and use resolution to prove the conclusion

        Anyone whom Mary loves is a football star.
        Any student who does not pass does not play.
        John is a student.
        Any student who does not study does not pass.
        Anyone who does not play is not a football star.

(Conclusion) If John does not study, then Mary does not love John.

22. Transform the following formulae into PNF and then into Skolem Standard Form.
    a) (∀x) (∃y) (Q(x, y)→ P(x))
    b) (∀x) (∃y) P(x, y) → ~ ((∃z) Q(z) ∩ R(x)))
    c) (∀x) (∃y) P(x, y) → ((∃y) P(x, y)
    d) (∀x) (∃y) P(x, y) ∩ ((∃z) Q(z) →R(x)))
    e) (∀x) (∃y) → Q(x)) → ((∃x) P(x) → (∃x)Q(x))
23. Explain the procedure to convert the formulae to CNF form.
24. Write short notes on Skolem Function.
25. Brief the purpose of Unification Algorithm with suitable example.

Unit-III

26. Explain the architecture of expert system and describe its components

27.   What is Bayes network. Design trouble shooting advisor for PC's using Bayesian Inference: CF Computer Fails (True or not). Two possible causes of failure: Electricity Failure (EF) and Mal function of the computer (MC)

    P(EF) = 0.3,

    P(MC) = 0.2

    P(CF/¬EF, ¬MC) = 0.0

    P(CF/¬EF,MC) = 0.5

    P(CF/EF, ¬MC) = 0.8

    P(CF/EF,MC) = 1.0

    Draw the Bayesian Network (with CPTs)

    Compute P(¬MC/EF)

    Compute P(¬CF, EF, ¬MC)

    Compute P(EF/CF)

28. Write short notes on

a. Fuzzy set and crisp set

b. Membership Functions

c. Fuzzy inference system

29. Explain briefly about

a. Utility theory

b. Expected utility

c. Axioms of Utility theory

Unit-IV

30. Explain learning in decision trees using information theory. Construct the decision tree for the data given below:

Day	Outlook	Temperature	Humidity	Wind	Play Tennis
D1	Sunny	Hot	High	Weak	No
D2	Sunny	Hot	High	Strong	No
D3	Overcast	Hot	Normal	Weak	Yes
D4	Rain	Mild	High	Weak	No
D5	Rain	Cool	Normal	Weak	Yes
D6	Rain	Cool	Normal	Strong	No
D7	Overcast	Hot	Normal	Strong	Yes
D8	Sunny	Cool	Normal	Weak	Yes
D9	Rain	Mild	Normal	Weak	Yes
D10	Sunny	Mild	Normal	Strong	Yes
D11	Overcast	Mild	High	Strong	Yes

31. What is Machine Learning? List the types of learning. Explain the differences between

a. Deductive and Inductive machine learning

b. Supervised, Unsupervised and Reinforcement learning

32. Briefly explain

a. General model of learning agents

b. Activation functions

33. Describe the architecture and learning rule of Perceptron.

34. Explain multilayer feed forward network and its training using back

propagation algorithm. Give the output of the network for the input [011]

35. Briefly write about

a. Reinforcement Learning Model

b. Difference between active and Passive RL

c. List RL Applications

Unit-V

36. Explain the importance of NLP. Explain the various phases of Natural

language processing. (NLP)

37. Write context free grammar and show a parse tree to correctly phrase the sentence

i.The cat sat on the mat

ii. Ramu teaches in a school at Hyderabad

38. Briefly explain

i.Steps of Automatic speech recognition

ii. DRAGON ASR

iii. HARPY ASR

39. Briefly explain low, mid and high-level vision

40. List at least five applications of

i.NLP (Natural Language Processing)

ii. ASR (Automatic Speech recognition)

iii. Computer Vision

41. List the achievements of AI in

    i.Games

    ii. Robot Systems