## UNIT 1

1. Research scientists all over the world are taking steps towards building computers with circuits patterned after the complex interconnections existing among the human brain's nerve cells. What name is given to such type of computers? (1)
   a) Intelligent computers
   b) Supercomputers
   c) Neural network computers
   d) Smart computers

2. The action of the Simple reflex agent completely depends upon (1)
   a) Perception history
   b) Current perception
   c) Learning theory
   d) Utility functions

3. Which search is implemented with an empty first-in-first-out queue? (1)
   a) Depth-first search
   b) Breadth-first search
   c) Bidirectional search
   d) None of the mentioned

4. The performance of an agent can be improved by (1)
   a) Learning
   b) Observing
   c) Perceiving
   d) None of the mentioned

5. Which is not the commonly used programming language for AI? (1)
   a) PROLOG
   b) Java
   c) LISP
   d) Perl

6. Agent's behavior can be best described by (1)
   a) Perception sequence
   b) Agent function
   c) Sensors and Actuators
   d) Environment in which agent is performing

7. Artificial Intelligence has its expansion in the following application. (1)
   a) Planning and Scheduling
   b) Game Playing
   c) Diagnosis
   d) All of the mentioned

8. A problem in a search space is defined by one of these states. (1)
   a) Initial state
   b) Last state
   c) Intermediate state
   d) All of the above

9. What is the expansion if PEAS in task environment? (1)
   a) Peer, Environment, Actuators, Sense
   b) Perceiving, Environment, Actuators, Sensors
   c) Performance, Environment, Actuators, Sensors
   d) None of the mentioned

10. What kind of environment is the crossword puzzle? (1)
    a) Static
    b) Dynamic
    c) Semi Dynamic
    d) None of the mentioned

11. Where does the performance measure is included? (1)
    a) Rational agent
    b) Task environment
    c) Actuators
    d) Sensor

1. What are the capabilities a computer should posses to pass Turing test? (2)
2. How an agent should act? (2)
3. What are the factors that a rational agent should depend on at any given time? (2)
4. List the steps involved in simple problem solving technique. (2)
5. List the properties of task environments. (2)
6. Define a Robotic Agent. (2)
7. Mention the five components of a node in a search tree. (2)
8. Write the time & space complexity associated with depth limited search. (2)
9. Define Agent Program. (2)
10. Define Branching factor b*. (2)
11. Why problem formulation must follow the goal formulation? (2)
12. What is the difference between uninformed and informed search strategies? (2)
13. What is autonomy? (2)
14. Define Path Cost. (2)
15. Point out some of the uninformed search techniques. (2)
16. Differentiate between a percept and a percept sequence. (2)
17. How is a fringe node different from a root node? (2)
18. Define a Human Agent. (2)
19. Define a Software Agent. (2)
20. When is a node said to be in the open category, a closed category? (2)
21. When a node is called a leaf node? (2)
22. Define a state. (2)
23. How is a node expanded? (2)
24. How the performance of the search algorithms measured? (2)

1. Differentiate agent program and agent function. Write the pseudocode for representing the skeleton of an agent. (5)
2. Discuss the foundation of artificial intelligence. (5)
3. Briefly explain the history of artificial intelligence. (5)
4. Explain two types of problem formulations in 8 Queens Problem. (5)
5. Briefly explain the four categories of artificial intelligence. (5)
6. Explain bi-directional search with an example. (5)
7. Write the pseudocode for Depth First Search. (5)
8. Explain Depth limited search in detail with suitable example. (5)

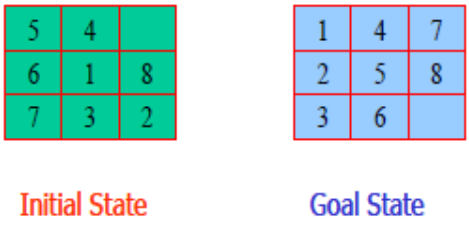
9. Explain about the intelligent agents in detail with a suitable diagram. (5)
10. Define a rational agent and list the factors on which the rationality of an agent is dependent on. (5)
11. Explain the five components of a node in a search tree. (5)
12. Explain the evaluation metrics of a search strategy. (5)
13. Differentiate between uninformed and informed search strategies. List any three algorithms under each category. (5)
14. Explain the three distinct problem types in the case of search with partial information. (5)
15. Enumerate the characteristics of Artificial Intelligence. (5)
16. Explain the four categories of Artificial Intelligence systems with a suitable diagram. (5)
17. Give any two examples for mundane, formal and expert tasks. (5)

1. Given a full 5-gallon jug and an empty 2-gallon jug, the goal is to fill the 2-gallon jug with exactly one gallon of water. You may use the following state space formulation. How to fill the 2-gallon jug with exactly one gallon of water? (8)

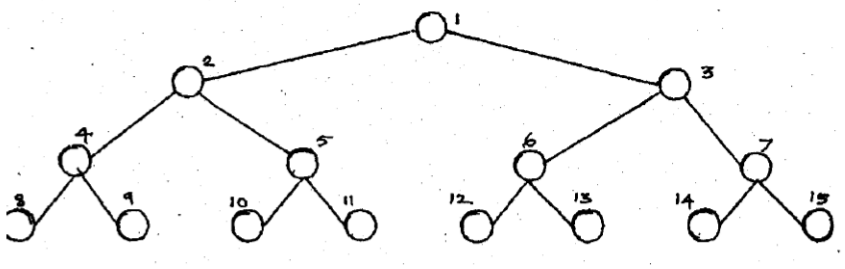
   State= (x, y), where x is the number of gallons of water in the 5-gallon jug and y is the number of gallons in the 2-gallon jug.

   Initial State = (5, 0)

   Goal State = (*, 1), where * means any amount
2. In the 8-puzzle problem we have a 3×3 square board and 8 numbered tiles. The board has one blank position. Blocks can be slid to adjacent blank positions. We can alternatively and equivalently look upon this as the movement of the blank position up, down, left or right. The objective of this puzzle is to move the tiles starting from an initial position and arrive at a given goal configuration. (8)




3. Explain simple reflex and model based agents with suitable sketch and write pseudocode for model based reflex agents. (8)
4. Outline the components and functions of any one of the basic kind of agent programs. (8)
5. Describe the procedure for performing Iterative deepening depth first search. Assume a tree tree configuration of your choice and a depth limit of 2. (8)
6. Show how BFS & DFS work on the search tree for given state space graph. (8)




7. Discuss with an example how the dimensions along which the properties of task environments categorized. (8)
8. Develop a PEAS description of the task environment for the following agents and select a suitable agent design. (8)
    a. Robot soccer player;
    b. Internet book-shopping agent;
    c. Autonomous Mars rover;
    d. Mathematician's theorem-proving assistant.
9. Differentiate between the depth first search and depth first limited search with suitable examples. (8)
10. Explain in detail about the properties of the following task environment: (8)
    a. Fully Observable vs. Partially Observable
    b. Deterministic vs. Stochastic
    c. Episodic vs. Sequential
    d. Static vs. Dynamic
11. In a situation where you would require to exploit the advantage of DFS and BFS, Which algorithm will you choose. Justify your answer with suitable examples. (8)
12. Explain the bidirectional search with an example. List out its advantages and limitations. (8)

13. Explain the task classification of Artificial Intelligence with a suitable diagram. (8)
14. Illustrate about any four applications of Artificial Intelligence for solving the real world problems. (8)

## UNIT 2

1. In many problems the path to the goal is irrelevant, this class of problems can be solved using, (1)
    a) Informed Search Techniques
    b) Uninformed Search Techniques

c) Local Search Techniques

d) Informed & Uninformed Search Techniques

2. Which of the Following problems can be modeled as CSP? (1)
   a) 8-Puzzle problem
   b) 8-Queen problem
   c) Map coloring problem
   d) All of the mentioned

3. The complexity of minimax algorithm is (1)
   a) Same as of DFS
   b) Space – bm and time – bm
   c) Time – bm and space – bm
   d) Same as BFS

4. Which value is assigned to alpha and beta in the alpha-beta pruning? (1)
   a) Alpha = max
   b) Beta = min
   c) Beta = max
   d) Both Alpha = max & Beta = min

5. Hill climbing search sometimes called _____ because it grabs a good neighbor state without thinking ahead about where to go next. (1)
   a) Needy local search
   b) Heuristic local search
   c) Greedy local search
   d) Optimal local search

1. How a game formulated as a search problem? (2)
2. State the advantages of the local search algorithm. (2)
3. Write the heuristic estimation function for A* search. (2)
4. What is cutoff search? (2)
5. State the properties of A* search. (2)
6. Define alpha-beta pruning. (2)
7. Define Annealing. (2)
8. How to view CSP as search problem? (2)

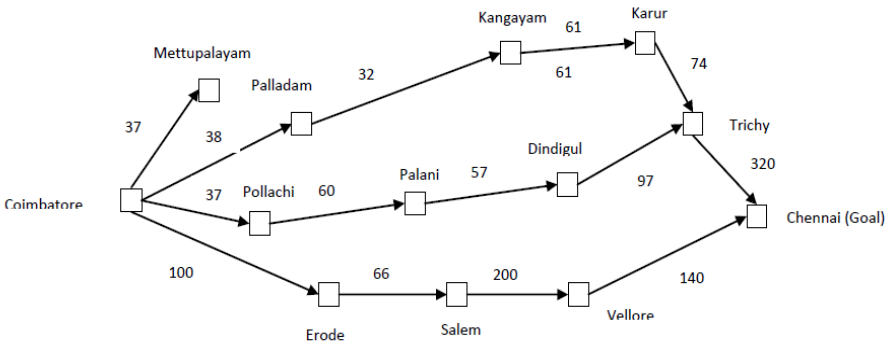
6. Define Heuristic function, h (n). (2)
7. What is Relaxed problems? (2)
8. What is the use of online search agents in unknown environment? (2)
9. Define Heuristic function. (2)
10. What is admissible heuristic? (2)
11. Give any four examples of real world CSP's. (2)
12. Define backtracking. (2)
13. Mention the four solution popular methods for CSPs. (2)
14. Write the time and space complexity of minimax algorithm. (2)
15. How optimal decisions made in Games? (2)

1. Draw the State Space diagram for Hill Climbing. Identify the problems in different regions in Hill climbing. Give reason. (5)
2. Draw the typical annealing schedule and write the pseudocode for the Simulated Annealing problem. (5)
3. Write short notes on heuristic function and apply for 8 puzzle problem. (5)
4. Illustrate Map Coloring problem using CSP. (5)
5. Describe the A* search and give the proof of optimality of A*. (5)
6. Discuss about Memory bounded heuristic search. (5)
7. Differentiate between Simulated annealing search and Local beam search. (5)
8. Define Genetic Algorithms (GA). What two requirements should a problem satisfy in order to be suitable for solving it by a GA? (5)
9. Describe the main features of Genetic Algorithms (GA). (5)
10. Enumerate about the properties of simulated annealing. (5)
11. Explain the different varieties of Constraint Satisfaction Procedure (CSP). (5)
12. Differentiate between a search and a game. (5)
13. Write the Alpha Beta procedure. (5)

1. See how Greedy best-first search works for the route-finding problems using the straight-line distance heuristic. (8)

| $h_{SLD}$ | | | |
|---|---|---|---|
| Coimbatore | 506 | Chennai | 0 |
| Erode | 100 | Karur | 93 |

| | | | |
|---|---|---|---|
| Mettupalayam | 37 | Kangayam | 50 |
| Pollachi | 36 | Trichy | 14 |
| Palladam | 38 | Palani | 60 |
| Salem | 66 | Dindigul | 57 |
| Vellore | 200 | | |




2. Explain Minimax algorithm and Solve the Tic-Tac-Toe problem using the Minimax algorithm. (8)
3. Discuss Genetic algorithm with an example and write the pseudocode. (8)
4. Explain any one algorithm for determining optimal moves in an adversarial search (games). (8)
5. Give the algorithm for solving constraint satisfaction problems by local search? (8)
6. How do you examine about Backtracking search for CSP? (8)

7. Explain the Constraint Satisfaction Procedure and solve the crypt arithmetic problem. (8)

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  C R O S S
+ R O A D S
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D A N G E R
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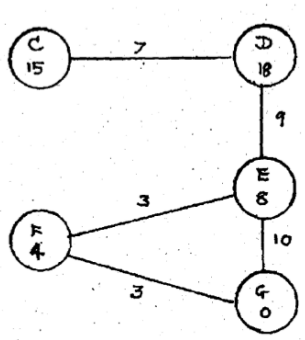
8. Illustrate A* search. Apply the algorithm for 8-puzzle problem with the starting point given below. Use Manhattan distance as heuristics. (8)

| | | |
|---|---|---|
| 1 | 5 | 2 |
| 4 | 8 | 3 |
| 7 | 6 | |

9. Apply A* search for the given tree, in which ‘C’ is the initial state and ‘G’ goal state. For each node in each stage, obtain cost estimates where g(n) is the numeral by the side of an arc and h(n) is the numeral at the node. (8)




14. Write the pseudocode for Alpha – Beta pruning and explain with a suitable example. (10)

10. Explain in detail about the online search agents. (8)

## UNIT 3

1. From which rule does the modus ponens are derived? (1)
   a) Inference rule
   b) Module rule
   c) Both Inference & Module rule
   d) None of the mentioned

2. Wumpus World is a classic problem, best example of _____ (1)
   a) Single player Game
   b) Two player Game
   c) Reasoning with Knowledge
   d) Knowledge based Game

3. What are the two functions we use to query and answer in the knowledge base? (1)

4. Translate the following statement into FOL. (1)
   “For every a, if a is a philosopher, then a is a scholar”
   a) ∀ a philosopher(a) scholar(a)
   b) ∃ a philosopher(a) scholar(a)
   c) All of the mentioned

d) None of the mentioned

5. Which rule is equal to the resolution rule of first-order clauses? (1)
   a) Propositional resolution rule
   b) Inference rule
   c) Resolution rule
   d) None of the mentioned

1. Give the definition of Horn clause. (2)
2. Distinguish between predicate and propositional logic. (2)
3. Define Logic. (2)
4. What is Modus Ponen's rule in Propositional logic? (2)
5. State the two important properties for inference. (2)
6. How TELL and ASK functions are used in first-order logic? (2)
7. Show objects, properties, functions and relations for the given example. (2)
   a. "EVIL KING JOHN BROTHER OF RICHARD RULED ENGLAND IN 1200"
8. What is Skolemization? (2)
9. What is an atomic sentence? (2)
10. Give the basic elements in the syntax of FOL. (2)
11. Write down the basic syntactic elements of first order logic. (2)
12. What would happen if we use the skolem function in resolution? (2)

1. State equivalence, validity and satisfiability. Write the standard logical equivalences. (5)
2. Discuss on the syntax and semantics in Propositional logic with an example. (5)
3. Write the any five sound rules of inferences with premises and conclusion. (5)
4. What is a knowledge-based agent? Write the algorithm for a knowledge-based agent using TELL and ASK function. (5)
5. Write short notes on entailment and derivation in propositional logic. (5)
6. How universal and existential instantiation used in FOL? Explain with an example. (5)
7. Write short notes on Storage and retrieval. (5)
8. Briefly discuss on Generalized Modes Ponen. (5)
9. State the pros and cons of Propositional logic and FOL. (5)

1. Explore the use of predicate logic as a way of representing knowledge by looking at a specific example. Consider the following set of sentences: (8)
   a) Marcus was a man.
   b) Marcus was a Pompeian.
   c) All Pompeians were Romans.
   d) Caesar was a ruler.
   e) All Romans were either loyal to Caesar or hated him.
   f) Everyone is loyal to someone.
   g) People only try to assassinate rulers they are not loyal to.
   h) Marcus tried to assassinate Caesar.

2. Use the steps of Knowledge Engineering from FOL for Wumpus world problem. (8)
3. Discuss about backward chaining and represent the following KB in the backward chaining chart. (8)

   Knowledge Base:

   –If [X croaks and eats flies] Then [X is a frog]

   –If [X chirps and sings] Then [X is a canary]

   –If [X is a frog] Then [X is colored green]

   –If [X is a canary] Then [X is colored yellow]

   –[Fritz croaks and eats flies]

   Goal:

   –[Fritz is colored Y]?

4. What is Unification? Write the pseudocode for Unification algorithm. (8)
5. What is forward and backward chaining? Explain the forward chaining algorithm and apply it for the following problem: (8)

   The law says that it is a crime for an American to sell weapons to hostile nations. The country Nono, an enemy America, has some missiles, and all of its missiles were sold to it by Col. West, who is an American. Prove that Col. West is a criminal.

6. What is First order logic? Represent the following sentences in first-order logic, using a consistent vocabulary that you must define: (8)
   a) Some students took French in Spring 2001.
   b) Every student who takes French passes it.
   c) Only one student took Greek in Spring 2001.
   d) The best score in Greek is always higher than the best score in French.

e) Everyone who buys a policy is smart.

f) No person buys an expensive policy.

g) There is an agent who sells policies only to those people who are not insured.

h) There is a barber who shaves all men in town who do not shave himself.

7. Write resolution algorithm and apply it to the Wumpus world problem to Convert the $B_{1,1} \Leftrightarrow (P_{1,2} \vee P_{2,1})$ into CNF. (8)

## UNIT 4

1. Which modifies the performance element so that it makes better decision? (1)

   a) Performance element

   b) Changing element

   c) Learning element

   d) None of the mentioned

2. How the decision tree reaches its decision? (1)

   a) Single test

   b) Two test

   c) Sequence of test

   d) No test

3. What are the advantages of neural networks over conventional computers? (1)

   (i) They have the ability to learn by example

   (ii) They are more fault tolerant

   (iii)They are more suited for real time operation due to their high 'computational' rates

   (a) (i) and (ii) are true

   (b) (i) and (iii) are true

   (c) all of them are true

4. In which of the following learning, the teacher returns reward and punishment to learner?(1)

   a) Active learning

   b) Reinforcement learning

   c) Supervised learning

   d) Unsupervised learning

5. Inductive learning involves finding a (1)
   a) Consistent Hypothesis
   b) Inconsistent Hypothesis
   c) Regular Hypothesis
   d) Irregular Hypothesis

6. Automated vehicle is an example of _____ (1)
   a) Supervised learning
   b) Unsupervised learning
   c) Active learning
   d) Reinforcement learning

1. Define Baye‘s rule. (2)
2. What is meant by reinforcement learning? (2)
3. Mention the major components that make up a learning agent. (2)
4. State Delta rule. (2)
5. Mention the basic characteristics a recurrent neural network. (2)
6. What is supervised training? (2)
7. How to build prior information into a Neural Network design? (2)
8. How the design of learning element is affected? (2)
9. What is Maximum-likelihood parameter learning? (2)

1. Discuss on Reinforcement learning. (5)
2. Describe the mathematical model of neuron with a neat sketch. (5)
3. How learning with hidden variables done? Explain EM algorithm. (5)
4. Describe the working of the basic EBL process. (5)
5. Write short notes on Kernel machines. (5)
6. Briefly outline different forms of learning. (5)

1. What are learning elements? Discuss on inductive learning. (8)
2. What is Decision tree? Design a Decision Tree for the Restaurant problem. (8)
3. What is statistical learning? Solve Candy Flavors example, using Posterior probability of hypotheses given: (8)

   Suppose there are five kinds of bags of candies:

   10% are h1: 100% cherry candies

   20% are h2: 75% cherry candies + 25% lime candies

40% are h3: 50% cherry candies + 50% lime candies

20% are h4: 25% cherry candies + 75% lime candies

10% are h5: 100% lime candies

Then observe candies drawn from some bag: What kind of bag is it? What flavor will the next candy be?

4. Explain learning agent with neat sketch. (8)
5. Discuss on explanation based learning with an example. (8)
6. Outline the main points of reinforcement learning and indicate how this enables an agent to act successfully in a given environment. (8)
7. Explain neural networks and briefly discuss about NN types with neat diagram. (8)
8. State Bayes Rule and explain how it is applied in statistical learning. (8)