09 Jan 2024

[This question paper contains 8 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 1676 **G**

Unique Paper Code : 2513012001

Name of the Paper : Artificial Intelligence and Machine Learning

Name of the Course : **B.Sc. (H) Electronics (GE/ DSE)**

Semester : III

Duration : 3 Hours Maximum Marks : 90

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. There are **seven** questions in all, out of which you have to attempt any **five** Questions.
3. Question no. **1** is compulsory.
4. **All** questions carry equal marks.

1. (a) Describe the various Modelling techniques used in Artificial intelligence? (3)

(b) What is Bayes theorem? Briefly explain the use of Bayes theorem for probabilistic reasoning in AI system (3)

(c) In what ways can the problem of over-fitting and under-fitting be dealt with? (3)

(d) Draw a comparison between simple linear regression and logistic regression? (3)

(e) In a class, there are 55% of the students who like English and 45% of the students who likes English and mathematics, and then what is the percentage of students those who like English also like mathematics? (3)

(f) For each of the following activities, give a PEAS description and task environment

(i) Taxi Driver

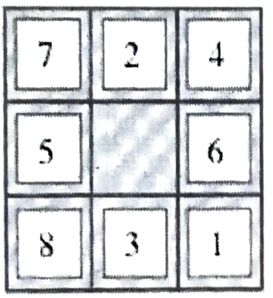
(ii) Medical Diagnosis System

(iii) Oil Refinery (3)

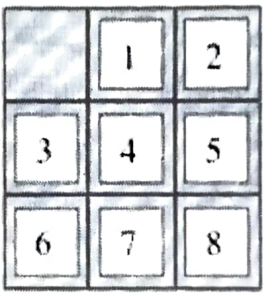
2. (a) What is a learning agent and why is it considered to be better than other types of agents? Explain the complete working of a learning agent with the help of a block diagram. (6)

(b) What are the various steps involved in the formulation of an AI problem? What is the state space representation of a problem? (6)

(c) A typical instance of the 8-puzzle toy problem is given with start and goal state. Describe the steps involved in Formulation of the AI problem to reach the goal state. (6)



Start State



Goal State

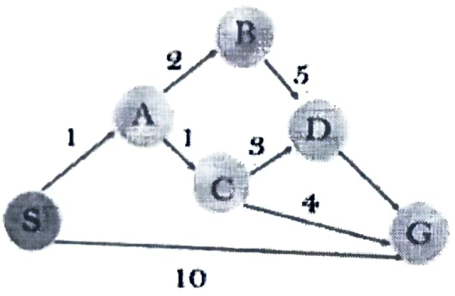
3. (a) Compare and differentiate between breadth first search (BFS) algorithm and depth first search (DFS) algorithm in terms of (i) Time Complexity, (ii) Space Complexity (iii) Optimality and (iv) Completeness (8)

(b) For the given search graph determine the optimum path from A to Z using (10)

(i) Uniform Cost Search

(ii) Greedy Best First Search

(iii) A* Search



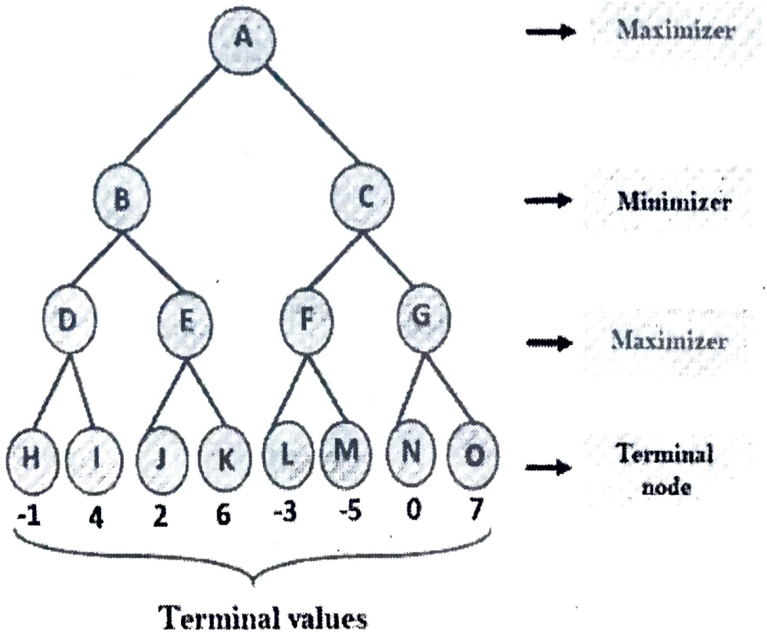
State	h(n)
S	5
A	3
B	4
C	2
D	6
G	0

4. (a) What do you mean by expert systems? Explain different types of learning using suitable real-world examples? (6)

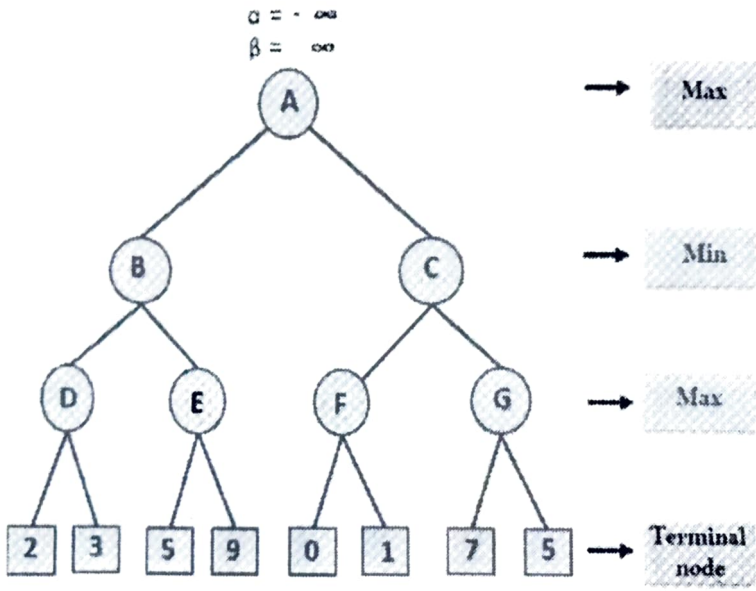
(b) What is KNN classification? Why is it called lazy learning? (6)

(c) Differentiate between classification and clustering? Explain various Clustering methods used in machine learning? (6)

5. (a) Explain why 'Minimax Game Search' algorithm is considered to be similar to depth first Search. For the given game search tree, apply minimax search to determine the complete game path and maximum score reached by MAX at the terminal layer. (9)



(b) What is advantage of alpha-beta pruning over minimax search? For the given game tree, determine the complete game path and maximum score reached by MAX player at the terminal using alpa-beta pruning. (9)



6. (a) Draw the Bayesian belief network and calculate the conditional probability for the condition such that the alarm has sounded, but there is neither a burglary, nor an earthquake occurred, and David and Sophia both called the Harry. (8)

(b) Describe simple Markov model and Hidden Markov model. Consider the Markov chain with three states, S = {1,2,3} that has the following transition matrix (10)

$$\begin{bmatrix} 1/2 & 1/4 & 1/4 \\ 1/3 & 0 & 2/3 \\ 1/2 & 1/2 & 0 \end{bmatrix}$$

(i) Draw the state transition diagram for this chain.

(ii) If we know $P(X_1 = 1) = P(X_1 = 2) = 1/4$. Find $P(X_1 = 3, X_2 = 2, X_3 = 1)$.

7. (a) What is the importance of Heuristic function h(n) in 'informed search algorithm'? How is Heuristic function different from path cost? Briefly explain the following parameters related to informed search algorithm

(i) Under-estimation and over-estimation of h(n)

(ii) Admissibility (9)

(b) Explain decision tree classification algorithm for supervised learning? (9)