

6E1555

Total No. of Questions : 14

Total No. of Pages : 04

Roll No. :

6E1555

B.Tech. VI-Sem. (Back) Exam. - 2025

COMPUTER SCIENCE AND ENGINEERING

6CS4-05 Artificial Intelligence

CS, IT

Time : 2 Hours

Maximum Marks : 80

Instructions to Candidates :

Attempt all five questions from Part-A, four questions out of six questions from Part-B and two questions out of three questions from Part-C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used / calculated must be stated clearly.

Use of following supporting material is permitted during examination.

(Mentioned in Form No: 205)

1.

ersahilkagyan.com

2.

PART-A

[5x2=10]

(Answer should be given up to 25 words only)

All questions are compulsory

Q.1. If a multi-agent system has 'n' agents, each of which has 'm' possible moves, the search space increases to how many possible states?

Q.2. Define the terms 'syntax' and semantics' for First Order Logic.

3. What is heuristic function?
4. What is an expert system?
5. What are membership functions with respect to neural networks?

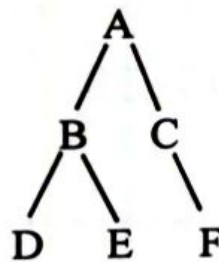
PART-B

[4x10=40]

(Analytical/Problem Solving Questions)

Attempt any four questions

1. Explain the working of DFS and BFS algorithms. Apply DFS and BFS to the following graph from node A and show the traversal order for both algorithms.



2. Enumerate classical 'Water jug problem'. Describe the state space for this problem. Solve this problem by giving its operation sequence.
3. A hospital uses a Bayesian network to diagnose whether a patient has lung cancer (C) based on two factors

Smoking (S) - whether the patient smokes

Coughing (X) - whether the patient has a cough.

The conditional probabilities are given as follows :

$$P(S) = 0.3 \text{ (30\% of people smoke)}$$

$$P(C/S) = 0.05, P(C/\neg S) = 0.01 \text{ (Lung cancer is more likely in smokers)}$$

$$P(X/C) = 0.9, P(X/\neg C) = 0.2 \text{ (Coughing is more likely in people with lung cancer)}$$

Given that a patient is coughing ($X = \text{True}$). Calculate the probability that the patient has lung cancer ($C = \text{True}$) using Baye's Theorem.

- Q.4. (a) Define supervised and unsupervised learning and explain this key differences with appropriate real world examples.
- (b) Consider a dataset containing information about customer purchases. Explain how would you apply supervised learning and unsupervised learning to analyse customer behaviour.
- Q 5. (a) Describe the main steps involved in Natural Language Processing (NLP)
- (b) Discuss at least four key challenges or issues faced in NLP.
- Q.6. Explain how probabilistic reasoning and fuzzy logic approaches can handle uncertainty in AI.

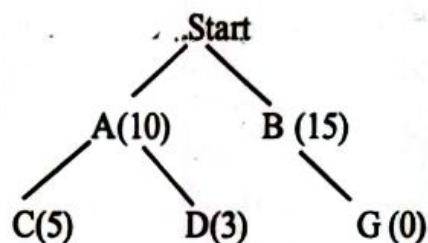
PART-C

[2x15=30]

(Descriptive/Analytical/Problem Solving/Design Question)

Attempt any two questions

- Q1. (a) Compare and contrast A* and AO* search algorithms based on evaluation functions, heuristic functions, optimality, completeness, advantages and disadvantages.
- (b) Consider the following road network with distances(g) and estimated time (h) :



the heuristic values (h) are given in brackets

The edge costs(g) are :

Start → A = 5

Start → B = 6

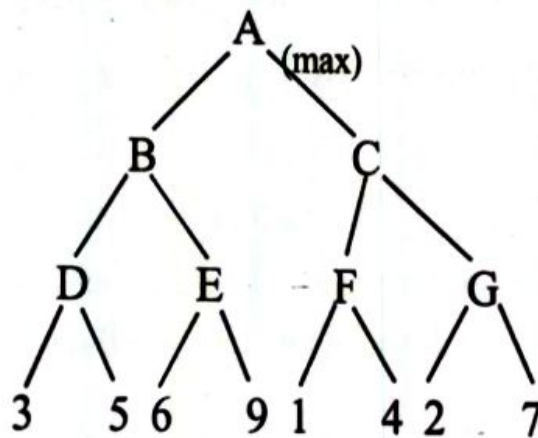
$$A \rightarrow C = 4$$

$$A \rightarrow D = 2$$

$$B \rightarrow G = 7$$

Using A* search, find the optimal route to G

- Q.2 (a) Describe the Mini-Max and Alpha-Beta pruning techniques in detail.
(b) Consider the following game tree with given evaluation values at leaf nodes:



Use the Minimax algorithm to determine the optimal move for the maximizing player at the root A. Apply Alpha-Beta pruning to show which nodes can be pruned and reduce the number of evaluations.

- Q.3 Consider the following sentences :
- (a) John likes all kind of food.
 - (b) Apples are food
 - (c) Chicken is food
 - (d) Anything anyone eats and is not killed by is food.
 - (e) Bill eats peanuts and is still alive
 - (f) She eats everything Bill eats.

Convert the following English statements into First-order Logic expressions and prove that 'John like peanuts by resolution.

----- x -----