

- (b) (i) Consider the problem of achieving a chair and table of matching color paint. Make your assumption, apply the following planning approaches, and derive the painting plan for the given scenario

- (1) Sensor less planning (3)
 (2) Conditional planning (3)
 (3) Replanning (4)

- (ii) Convert the following FOL sentences into English statements (5)

- (1) $\forall x \forall y (\text{CHILD}(x) \wedge \text{CANDY}(y) \rightarrow \text{LOVES}(x, y))$
 (2) $\forall x (\exists y (\text{CANDY}(y) \wedge \text{LOVES}(x, y))) \rightarrow \neg \text{FANATIC}(x)$
 (3) $\forall x ((\exists y (\text{PUMPKIN}(y) \wedge \text{EAT}(x, y))) \rightarrow \text{FANATIC}(x)$
 (4) $\forall x \forall y (\text{PUMPKIN}(y) \wedge \text{BUY}(x, y) \rightarrow \text{CARVE}(x, y) \vee \text{EAT}(x, y))$
 (5) $\exists x (\text{PUMPKIN}(x) \wedge \text{BUY}(\text{John}, x))$.

Reg. No. :

Question Paper Code : 90041

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2022.

Fourth Semester

Artificial Intelligence and Data Science

AD 8402 — ARTIFICIAL INTELLIGENCE — I

(Regulations 2017)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. List down the significant applications of Artificial Intelligence.
2. Identify and Justify the PEAS for the following Agent: Practicing tennis against a wall.
3. Mention the steps involved in problem-solving.
4. List the four significant performance measures to evaluate an algorithm.
5. Represent the different types of local consistency regarding the CSP-based Inference process.
6. Distinguish between Mini-Max and Alpha-Beta pruning methods.
7. Mention the three practical uses of Logic in AI.
8. Difference between Propositional logic and first-order-logic.
9. How planning differs from scheduling?
10. Mention the two significant categorizations of planning in AI.

PART B — (5 × 13 = 65 marks)

11. (a) Discuss in detail the following AI-based agents with suitable sketch
 - (i) Model-based agents (4)
 - (ii) Goal-based agents (4)
 - (iii) Learning-based agents. (5)

Or

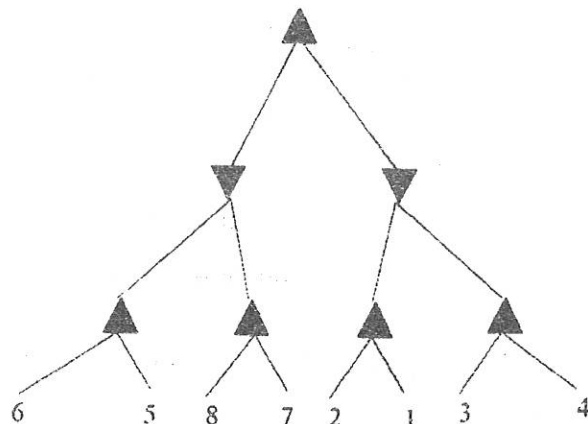
- (b) (i) Distinguish between Breadth First Vs. Depth First Search in AI domain (4)
- (ii) Represents the various PEAS factors for the following scenario
 - (1) Satellite image analysis system (3)
 - (2) Part-picking robot (3)
 - (3) Interactive English tutor. (3)

12. (a) Distinguish between the following searching techniques. Also, mention its advantages and disadvantages with an example.
- (i) Local Beam Search (6)
 - (ii) Stochastic Beam Search. (7)

Or

- (b) Explain in detail about Genetic Algorithm with suitable examples.

13. (a) Explain Alpha-Beta pruning and apply the same for the following graph, Explain the process in detail.



Or

- (b) Discuss in detail about constraint satisfaction problem with a suitable example.

14. (a) Knowledge Base : 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. Prove that "If John does not study, then Mary does not love John." Convert the knowledge base to FOL and use the resolution (proof by contradiction) technique to answer the query.

Or

- (b) Suppose you have developed the following rules for your weather forecasting system

Rule-I

IF we suspect the temperature is less than 20° AND there is humidity in the air, THEN there are chances of rain

Rule-II

IF Sun is behind the clouds AND the air is very cool, THEN We suspect the temperature is less than 20°

Rule-III

IF the air is very heavy, THEN there is humidity in the air

Also, the following facts have been given:

- (i) Sun is behind the clouds
- (ii) Air is very heavy and cool.

Construct an AND-OR graph for the above weather forecasting system. To conclude "that there are chances of rain" using Forward and Backward chaining.

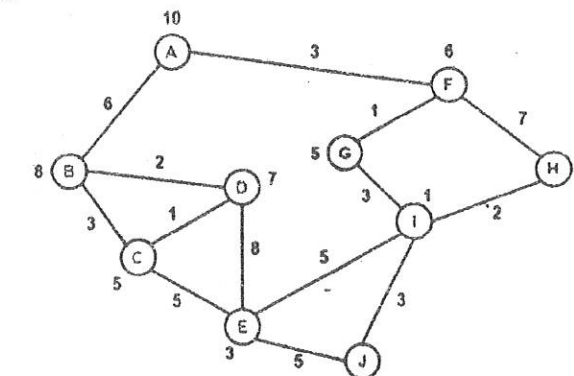
15. (a) Define ontology and, elaborate on its components. Also, construct the ontology for the following : Educational university. Explain the constructed ontology.

Or

- (b) Write short notes on
 - (i) Hierarchical Task Network
 - (ii) Continuous planning.

PART C — (1 × 15 = 15 marks)

16. (a) Consider the following graph with starting state A and goal stage J. The numbers on the edges indicate the cost of traversing the edge. Heuristic values are given near the corresponding node in the graph. (Note : If more than one node has a similar value, use lexicographical order for tie-breaking)



- (i) Apply greedy best first search algorithm and list the nodes in the order in which they are expanded. (6)
- (ii) Apply the A* search algorithm to the same graph and prove that it returns the optimal path. (9)

Or