

[This question paper contains 04 printed pages)

Your Roll No

Sr. No. of Question Paper : 10196
Unique Paper Code : 2342202403
Name of the Paper : Artificial Intelligence
Name of the Course : B.A _Prog _SOL
Semester : IV

Duration: 3 Hours

Maximum Marks: 90

Instructions for Candidates

1. Write your Roll No. on the top immediately upon receipt of this question paper.
2. **Section A** is compulsory.
3. Attempt **any 4** questions from **Section B**.
4. Parts of the question must be answered together.

Section A

- Q1.
- a) Explain constraint satisfaction problem? 2
 - b) Write short note on Robotic rights. 2
 - c) Transform the following sentence into disjunctive normal form:
 $P \rightarrow ((Q \& R) \leftrightarrow S)$. 3
 - d) Develop a parse tree for the sentence "Radhika stands on the bench" 3
 - e) What are the limitations of hill climbing search algorithm ? 3
 - f) Describe the working of a learning agent. 3
 - g) Differentiate between Deterministic and Stochastic Environment. 4
 - h) What is uninformed search? Explain any two uninformed search algorithms. 5
 - i) Write a Prolog programme MAXLIST(L,Max) to find the greatest number Max in the list L. 5

Section B

- Q2 a) Explain the difference between Top-Down parsing and Bottom-Up parsing, with suitable examples of each. 4
- b) Write a script for checking into a hotel. 5

- c) Write the PEAS for an Automatic Vacuum Cleaning Robot. 6
- Q3. a) Describe the effect of cut in search tree during Prolog execution, illustrating with an example. 4
- b) Explain Greedy Best-First Search. What are its limitations? 5
- c) Discuss the difference between formal and natural languages, with focus on syntax and ambiguity. 6
- Q4. a) Which of the following is not logically equivalent and why? 4
- i) $((a \wedge b) \vee (\neg a \wedge \neg b))$ and $a \leftrightarrow b$
- ii) $((m \wedge n) \rightarrow p)$ and $((m \rightarrow p) \wedge (n \rightarrow p))$
- b) Construct an associative network for the following passage: 5
- "A college called ABC Institute has three departments: Information Technology, Civil Engineering, and Mechanical Engineering. Prof. Mehta is the Head of the Information Technology department. Suresh and Priya are faculty members in the Information Technology department. Priya is married to Akash, who works as a doctor at City Hospital. Priya and Akash have one child and live on Lake View Road. Priya wears contact lenses and is five feet two inches tall."
- Represent the network using labelled directed edges.
- c) Write a Prolog program to implement Power(N,P,Res) where N is raised to power P to get Res. 6
- Q5 a) Explain Conceptual Dependency(CD) theory and its primitive acts. Using CD notation, represent the sentence "Ravi gives Sita a flower," clearly labelling all dependency links and case roles. 4
- b) Create a frame for terrestrial motor vehicles (cars, trucks, motorcycles) and give one complete frame in detail for cars which includes the slots for the main component parts, their attributes, and relations between parts. 5
- c) Explain the Chomsky Hierarchy of formal grammars. Briefly describe the four classes it consists of, along with their relative expressive power. 6
- Q6. a) Express the following sentences as FOPL: 4
- I. All citizens were either supportive of the king or opposed to him.
- II. Some students studying Data Science are creative and disciplined.

b) Define A* search algorithm and write its evaluation function. State the admissibility criterion required for a heuristic used in the A* search algorithm. 5

c) Solve the cryptarithmic problem using : 6

$$\begin{array}{r} \text{BASE} \\ + \text{BALL} \\ \hline \text{GAMES} \end{array}$$

Q7 a) Discuss the dangers posed by bias in AI-driven decision-making. Suggest two strategies to promote fairness in AI systems. 4

b) Define unification. Find whether the following sets are unifiable or not? If they are unifiable, find most general unifier (m.g.u.) else give justification why they are not unifiable. 5

- I. $\{C(x, \text{Delhi}), C(\text{Mumbai}, y)\}$
- II. $\{D(f(x), y), D(z, f(z))\}$

c) For the given game tree, compute the value obtained at the root node assuming it is a maximizing node. Also identify the nodes that get eliminated when alpha-beta pruning is applied. 6

