

[This question paper contains 4 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 2625

L

Unique Paper Code : 2342202403

Name of the Paper : Artificial Intelligence

Name of the Course : **B.A. (P)**

Semester : IV

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. **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) Define the term Rational Agent. 2
- b) Write the condition for admissible heuristic of A* algorithm. 2
- c) Explain using a diagram how an agent interacts with the environment through sensors and actuators? 4
- d) Determine whether the sentence is valid, contradictory or satisfiable. 4
- $(P \rightarrow Q) \vee (Q \rightarrow R)$
- e) Write the PEAS for an automated taxi driver. 4
- f) Write a Prolog program to reverse a list L. 4

P.T.O.

g) Give the conceptual dependency representation for the following: 4

Seema gave a book to Raghav

h) State the difference between: 6

- I. Model-Based Agent and Goal-Based Agent
- II. Weak AI and Strong AI
- III. Fully Observable and Partially Observable Environment

Section B

Q2 a) Given the following grammar: 4

1. $S \rightarrow NP VP$
2. $NP \rightarrow Det N \mid NP PP$
3. $VP \rightarrow V NP \mid V NP PP$
4. $PP \rightarrow P NP$
5. $Det \rightarrow The \mid a$
6. $N \rightarrow girl \mid cat \mid mat$
7. $V \rightarrow placed$
8. $P \rightarrow on$

Derive the parse tree for the sentence “The girl placed the cat on a mat” using above grammar.

b) Write a script for going to a movie. 5

c) Compare and Contrast between Breadth First Search and Best First Search. 6

Q3. a) What is cut and fail facility in Prolog? Explain using an example. 4

b) Explain the Hill climbing search. What are its limitations? 5

c) Transform the following term into Clausal form 6

$$\exists x \forall y \forall z (P(f(x), y, z) \rightarrow (\exists u Q(x, u) \wedge \exists v R(y, v)))$$

- Q4. a) Which of the following is not logically equivalent and why? 4
- $((p \wedge q) \vee (\neg p \wedge \neg q))$ and $p \leftrightarrow q$
 - $((p \wedge q) \rightarrow r)$ and $((p \rightarrow r) \wedge (q \rightarrow r))$
- b) Draw an associative network for the following sentence: 5
- A university called XYZ University has three departments: Computer Science, Electronics, and Mechanical Engineering. Dr. Bajaj is the Head of the Computer Science department. Ram and Neha are faculty members in the Computer Science department. Neha is married to Rohan, who works as a journalist for The Times of India. Neha and Rohan have two children and live on Park Road. Neha wears spectacles and is five feet six inches tall. Represent the network using labelled directed edges.
- c) a) Transform the following FOPL into the corresponding CNF: 6
- $(\neg A \wedge B) \vee (A \wedge \neg B) \wedge C$
 - $P \vee (\neg P \wedge Q \wedge R)$
 - $(\neg P \vee Q) \rightarrow (R \wedge \neg S)$
- Q5. a) What is a Recursive Transition Network? Explain using a suitable example. 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) List the four types in the Chomsky Hierarchy of grammars and briefly describe each one. 6
- Q6. a) Express the following sentences as FOPL: 4
- All Romans were either loyal to Caesar or hated him.
 - Some students studying Artificial Intelligence are genius and hardworking.

b) What is Modus Ponens? Give an example. Give two limitations of Propositional logic. 5

c) Solve the cryptarithmic problem using : 6

$$\begin{array}{r} \text{YOUR} \\ + \text{YOU} \\ \hline \text{HEART} \end{array}$$

Q7 a) Define the following: 4

I. Fairness in AI

II. Biases in AI

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. $\{S(x, \text{Hari}), S(y, \text{Geeta})\}$

II. $\{P(x, y), P(f(x), z), P(z, x)\}$

c) Consider the following game tree and find the value of the maximum at the root node. Which nodes will be pruned according to the alpha-beta pruning procedure? 6

