Your Roll No .....

Sr. No. of Question Paper	**: 13204**
Unique Paper Code	: 2344000022
Name of the Paper	: Artificial Intelligence
Name of the Course	: Computer Science – Generic Elective
Semester	: V

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

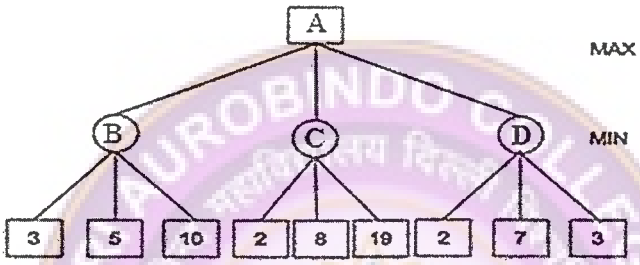
Q1 (a) List two application of AI. (2)

(b) What is Computer Vision? Mention any two applications of Computer Vision. (3)

(c) Explain the concept of rationality in intelligent agents. How does a rational agent differ from a human agent? Give a suitable example. (3)

(d) Write a PROLOG program to implement max(X, Y, M) so that M is the maximum of two numbers X and Y. (3)

(e) Find the value of A at the root node using MIN-MAX algorithm (3)



(f) Give the PEAS description for the task environment: Automated Taxi Driver. (4)

(g) Differentiate between Utility-based agent and Model-based agent. (4)

(h) Differentiate between uninformed search and informed search. (4)

(i) Transform the following into CNF: (4)

i. P V (~ P & Q & R)

ii. (~P & Q) V (P & ~ Q) & S

Section B

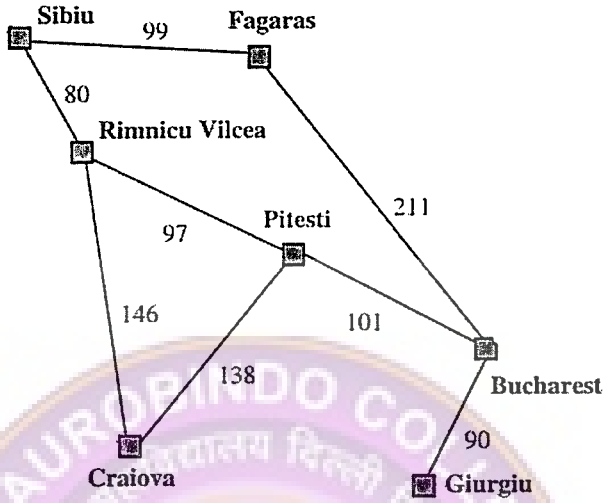
Q2 (a) Why is best first search better than breadth first search? (4)

(b) Consider the following axioms: (5)
A1: Rajesh likes all kind of food.
A2: Banana and Orange are food.
A3: Anything anyone eats and not killed is food.
A4: Madhav eats cashews and is still alive.
A5: Anyone who is killed, is not alive.
Express the above axioms into First Order Predicate Logic (FOPL) statements.

(c) Consider the Romania Map Search Problem. (6)
A problem-solving agent is required to find a path from the initial state: Sibiu to the goal state: Bucharest. From the problem-solving agent's point

of view, define and explain the following components of the search problem:

- Initial State
- Goal State
- State Space
- Actions
- Transition Model
- Path Cost



Q3 (a) Explain any two situations where hill climbing algorithm may fail to find a solution. How can we deal with these scenarios? (4)

(b) Define heuristic function. Why should the heuristic function of A* algorithm should never overestimate the actual cost? (5)

(c) Comment on the following statements and give justification for your answers (6)

i. Deterministic, sequential and dynamic are the most challenging environment for agents.

ii. How does the Alpha–Beta Pruning algorithm differ from the Minimax algorithm?

Q4 (a) Draw an Associative network for the following sentence: Tweety is a yellow bird that has wings and tail. (4)

(b) Transform the following expression to clausal form: (5)
$\forall x \forall y(\exists z P(x,z) \& P(y,z)) \rightarrow \exists u Q(x, y, u)$

(c) Solve the following crypt-arithmetic problem using constraint satisfaction: (6)

$$\begin{array}{r} \text{TWO} \\ +\ \text{TWO} \\ \hline \text{FOUR} \end{array}$$

Q5 (a) Draw the parse tree for the sentence "Mary slept on the sofa" using the following grammar: (4)

S → NP VP
NP → N | DET N
VP → V | V PP
PP → PREP NP
N → Mary | sofa
V → slept
DET → the
PREP → on

(b) What is Recursive Transition Network (RTN). Explain using an example. (5)

(c) Express the following sentences as conceptual dependency structure: (6)

i. Rohan gave Teena a box of chocolates.
ii. John pushed the wall.

Q6 (a) Define an agent using a suitable diagram. What is the role of sensors and actuators in an agent? (4)

(b) Create a frame network for transportation methods and give one complete frame for any one type of transportation method which includes the slots for the main component parts, their attributes and relations between parts. (5)

(c) Describe any three types of environments in which agents operate. Give suitable examples for each. (6)

Q7 (a) Give an example of each of the four types of Chomsky's hierarchy of grammars. (4)

(b) Write a Script for going to a movie. (5)

(c) Translate the following sentences into clausal form and use resolution technique to draw the required inference. (6)

S1: Some patients like all doctors.
S2: No patient likes any quack.
Conclusion: Therefore, no doctor is a quack.