

RAMAKRISHNA MISSION VIDYAMANDIRA

(Residential Autonomous College affiliated to University of Calcutta)

B.A./B.Sc. SIXTH SEMESTER EXAMINATION, MAY 2025

THIRD YEAR [BATCH 2022-25]

COMPUTER SCIENCE [Honours]

Date : 05/05/2025

Time : 11 am – 1 pm

Paper : CC 13

Full Marks : 50

Answer **any five** questions:

[5×10]

1. a) What is the characteristic of a Decomposable problem?
b) What do you mean by Deterministic, Non-deterministic, Uncertain and Stochastic agent environment?
c) Compare simple reflex-based agent and goal-based agent. [2+4+4]
2. a) Propose a heuristic for the following search problem: *Finding the shortest path in a university campus with one-way pathways and restricted zones.*
b) Write a short note on Stochastic Hill Climb.
c) What is adversarial search, and how does it differ from traditional search algorithms. [3+4+3]
3. a) Represent the following problem as a CSP: *A Sudoku puzzle with a 9×9 grid where each row, column, and 3×3 subgrid must contain the numbers 1–9 without repetition.*
b) Consider the predicate $H(x, y) = 'x \text{ helps } y'$. Write down English sentences for the following.
(i) $\forall x \exists y H(x, y)$ (ii) $\exists y \forall x H(x, y)$ [4+6]
4. a) Write the following sentence in First-Order Logic (FOL) and then convert to Normal Form:
"Every scientist publishes at least one research paper."
b) Show whether the following sentence is valid or invalid:
"If the machine is working, then the factory produces goods. If the factory produces goods, then the market is supplied. But the market is not supplied. Therefore, the machine is not working."
c) Represent the following knowledge base using Semantic Net:
Tom is a cat. Tom caught a bird. Tom is owned by John. Tom is ginger in colour. Cats like cream. The cat sat on the mat. A cat is a mammal. A bird is an animal. All mammals are animals. Mammals have fur. [3+4+3]
5. a) Given:
Initial State: At college without degree and job
Goal State: At Office with job.
Design a Plan from source to Goal state using STRIPS or ADL.
b) What is partial order in Planning?
c) Define Non-monotonic reasoning with example. [5+3+2]
6. a) Compare Fuzzy Logic with Probability with suitable example.
b) Implement AND and OR with McCulloch-Pitts neural model.
c) What do you mean by Linear Separability? Give example. [3+5+2]
7. a) We want to compare the strength of two types of concrete. Four concrete masonry units (CMUs) from each type of concrete are stressed until they fail. The lowest stress at failure of a CMU is denoted 1, and the highest stress at failure is denoted 4, so the CMUs are rank ordered by failure stress, that is, $X = \{1, 2, 3, 4\}$. Since "failure" of CMUs is fuzzy, the membership value for a specific CMU represents the judgment that the CMU really failed. The following fuzzy sets represent the failure estimates for the two different concrete types: $A = \{0.15/1 + 0.25/2 + 0.6/3 + 0.9/4\}$ and types $B = \{0.2/1 + 0.3/2 + 0.5/3 + 0.8/4\}$. Calculate the union, intersection, and the difference for the two concrete types.
b) State the difference between crisp set and fuzzy set. [8+2]