

RAMAKRISHNA MISSION VIDYAMANDIRA

(Residential Autonomous College affiliated to University of Calcutta)

B.A./B.Sc. SIXTH SEMESTER EXAMINATION, MAY 2023

THIRD YEAR [BATCH 2020-23]

COMPUTER SCIENCE [Honours]

Date : 11/05/2023

Time : 11 am – 1 pm

Paper : CC13

Full Marks : 50

Answer **any five** questions:

[5×10]

1. a) Suppose you design a machine to pass the Turing test. What are the capabilities such a machine must have?
b) Explain Reflex Based agent and Goal based agent.
c) Compare Episodic and Sequential task environments. (4+3+3)
2. a) Write three different state space formulations for the 8 queen problem.
b) You are given two jugs, a 2 litre one and a 5 litre one. Neither have any measuring markers on it. You need to get exactly 4 litres of water in any one of the jugs. Write down different operators and their effects and show a solution of the problem, (4+6)
3. a) Write a short note on Stochastic Hill Climb search with proper example.
b) Consider the two player game '5 stone nim'. In this game five stones are kept in a pile. Each player removes one or two stones from the pile. The last player to remove a stone from the pile is the winner. Draw a game tree for the given game and show a winning path for the MAX player. (5+5)
4. a) Consider the following classroom scheduling problem: There are 4 classes, C1, C2, C3, and C4, and 3 class rooms, R1, R2, and R3. The following table shows the class schedule:

Class	Time
C1	8:30 am. To 10:30 a.m.
C2	9:00 am. To 11:30 a.m.
C3	10:00 am. To 12:30 p.m.
C4	11:00 am. To 1:30 p.m.

In addition, there are the following restrictions: Each class must use one of the 3 rooms, R1, R2, R3; R3 is too small for C3; R2 and R3 are too small for C4. In CSP formulation i) show the initial possible values for each variable and ii) Express all the possible constraints for the problem.

- b) What do you mean by Admissible heuristic? Why is A* called admissible? Explain. (6+4)
5. a) Write a short note of Unification and Substitution.
b) Consider the predicate $P(x, y) = \text{"x admires y"}$. Write down english sentences for the followings:
i) $\forall x \exists y P(x, y)$
ii) $\exists y \forall x P(x, y)$ (6+4)
6. a) Using First Order Predicate logic show that "A car in the garage has an engine problem" and "Every car in the garage has been sold" imply the conclusion "A car has been sold has an engine problem".
b) What kind of problem domains is addressed by Soft Computing? Explain.
c) Design a McCulloch-Pitts neuron to implement XOR operation. (4+2+4)

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)

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