Exam.Code:0923
Sub. Code: 33552

2076
B.E. (Information Technology)
Fifth Semester
PCIT-502: Artificial Intelligence

Time allowed: 3 Hours | Max. Marks: 50

NOTE: Attempt five questions in all, including Question No. I which is compulsory and selecting two questions from each Section. Any missing or misprinted data maybe assumed suitably.

x-x-x

I. a) What is the Turing Test?

b) Define the heuristic function h(n) in the A* algorithm.

c) Differentiate between forward and backward chaining.

d) What is a partial-order plan?

e) What is an Expert System shell? (5x2)

Section - A

II. a) Discuss the dynamic behavior of a system driven by intelligent agents. How do fully observable and partially observable environments impact agent design?

b) Explain the role of Artificial Intelligence in Natural Language Processing, specifically focusing on syntactic analysis and semantic interpretation. (2x5)

III. a) Describe the Hill Climbing algorithm. Identify its three major limitations and propose a computational strategy to overcome each.

b) Execute the Alpha-Beta pruning algorithm on a 3-level game tree where the terminal leaf values from left to right are: 3, 5, 2, 9, 12, 5, 23, 23. Determine the final backed-up value at the root and highlight the pruned branches. (2x5)

IV. a) Explain Resolution in Propositional Logic with a critical thinking example. Show how proof by contradiction is executed.

b) Differentiate between strong and weak slot-and-filler structures. Provide one example of where a strong slot-and-filler structure is computationally superior. (2x5)

Section - B

V. a) Two machines M1 and M2 produce 60% and 40% of factory output respectively. The defect rates are 2% for M1 and 5% for M2. If a randomly selected item is defective, compute the probability that it was produced by M2 using Bayes' theorem.

b) An expert system contains the following knowledge:

- Birds normally fly.
- Penguins are birds.
- Penguins cannot fly.
- Tweety is a penguin.

Contd.....P/2

Using default reasoning, answer the following:

i) Explain how the system derives whether "*Tweety can fly*".

ii) Discuss how default reasoning resolves the conflict between the general rule and the exception.

iii) Explain why default reasoning is more suitable than classical logical reasoning in this scenario. (2x5)

VI. a) A logistics company deploys a fleet of autonomous delivery robots in a warehouse. Each robot independently plans its route while sharing the same workspace with other robots. During peak hours, several robots attempt to access the same loading station simultaneously, leading to delays and occasional deadlocks.

i) Which type of planning is more suitable in this scenario?

ii) Identify at least three coordination challenges that may arise among the robots.

iii) Propose suitable planning or coordination strategies to minimize conflicts and improve overall system efficiency.

iv) Discuss how the planning process would change if one robot unexpectedly breaks down while executing its task.

b) Describe the STRIPS representation language used in AI planning. Using the action Move(BlockA, BlockB, Table), specify its preconditions, add list, and delete list. Explain the role of each component in representing the action. (2x5)

VII. a) Explain the fundamental differences between Inductive Learning and Deductive Learning. Why is inductive learning heavily utilized in modern machine learning?

b) An expert system is proposed to assist doctors in diagnosing common respiratory diseases such as influenza, pneumonia, and asthma based on symptoms, medical history, and laboratory test results.

Answer the following:

a) Discuss the feasibility of developing such an expert system.

b) Identify the components required to build the expert system.

c) Explain how the system would handle uncertain or incomplete information.

d) Mention any two advantages and two limitations of using an expert system for medical diagnosis. (2x5)