

BE2-R3: ARTIFICIAL INTELLIGENCE AND APPLICATIONS

NOTE:

1. Answer question 1 and any FOUR from questions 2 to 7.
2. Parts of the same question should be answered together and in the same sequence.

Time: 3 Hours

Total Marks: 100

1.

- a) Why image understanding is considered as an AI application?
- b) What is constraint satisfaction problem in connection with AI problem solving and search? Illustrate with example.
- c) What are modus ponens and modus tollens?
- d) Draw the inference network for the rule-based system for Mr. Holme's situation containing the following rules:
R1: if WATSON'S CALL then ALARM, CF1=.5
R2: if GIBBON'S CALL then ALARM, CF2=.9
R3: if ALARM then BURGLARY, CF2=.99
Find CF4 for the following rule, R4.
R4: if WATSON'S CALL and GIBBON'S CALL then ALARM, CF4 using parallel combination function.
- e) How Atoms are defined in PROLOG? Give the derivation tree for finding the members of the list member(X, [1, 2, 3, 4].
- f) Enumerate the LMS algorithm for the adaptation of a feedforward neural network.
- g) Indicate how neural networks can be used in motion planning of mobile robots.

(7x4)

2.

- a) What are the building blocks of an expert system? Explain the process of knowledge acquisition.
- b) What is A* algorithm? Under what conditions A* algorithm produces optimal solution or always guarantees a solution.
- c) Discuss conflict resolution in forward chaining inference engine.

(6+6+6)

3.

- a) Discuss Alpha-Beta pruning.
- b) Clearly explain Belief Function.
- c) Distinguish between non-monotonic reasoning and monotonic reasoning.

(5+5+8)

4.

- a) Give an example of how a linear inequality can be used to encode a temporal plan constraint.
- b) What is supervised learning and unsupervised learning?
- c) Describe the LR Parsing algorithm. What are its advantages?

(6+6+6)

5.

- a) What do you mean by knowledge engineering?
- b) Solve the following cryptarithmic constraint satisfaction problem.

$$\begin{array}{r} \text{T W O} \\ + \text{T W O} \\ \hline \text{FOUR} \end{array}$$

(6+12)

6.

- a) Give the relational graph corresponding to the following predicate formula.
 $(\exists x)(\exists y)(\exists z) (\text{isStagirite}(x) \wedge \text{teaches}(x, y) \wedge \text{isMacedonian}(y) \wedge \text{conquersTheWorld} \wedge \text{isDiscipleOf}(y, z) \wedge \text{isOpponentOf}(y, z) \wedge \text{isAdmiredByChurchFathers}(z))$ where \wedge is the conjunction operator and \exists is the existential operator.
- b) Convert the above predicate into well formed formula.
- c) Design the Bidirectional Associative Memory for two associations A1:B1 and A1:B2 where $A1 = (1, 0, 1, 0, 1, 0)$, $B1 = (1, 1, 0, 0)$
 $A2 = (1, 1, 1, 0, 0, 0)$, $B2 = (1, 0, 1, 0)$
Show how to retrieve association A1 from the associative memory.

(6+6+6)

7.

- a) What do you mean by Unification in Prolog?
- b) How objects are recognized in an image? Explain briefly any one technique.
- c) What is the difference between fuzzy logic and probabilistic logic?

(6+6+6)