

## C14-R3: AI AND NEURAL NETWORKS

**NOTE:**

1. Answer question 1 and any FOUR questions from 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) Compare and contrast Backward Reasoning with Forward Reasoning.
  - b) Describe, how the branch and bound technique could be used to find the shortest solution. What are the disadvantages of it?
  - c) Differentiate between non monotonic reasoning and non monotonic logic.
  - d) Production system and control strategies are two approaches of problem solving. Discuss the important characteristics of production system and control strategy.
  - e) Define frame based system as a knowledge representation technique.
  - f) Explain the principal of means end analysis approach to problem solving.
  - g) The rate at which ANNs learn depends upon several controllable factors. Describe such factors in detail. What would be the ideal learning rate?

**(7x4)**

2.
  - a) Give the difference between Best First Search and Hill Climbing technique.
  - b) Can a single neuron learn a task? How does the perceptron learn its classification tasks?
  - c) "Increasing the number of hidden layer neurons gives a better function approximation." Is this statement correct? Justify your answer.
  - d) How do you distinguish between a Knowledge Based System and an Expert System? Describe four major problems faced by an Expert System?

**(4+5+4+5)**

3.
  - a) Give the first-order logic representation of following sentences.
    - i) Not all students take both history and biology.
    - ii) No person likes a smart vegetarian.
    - iii) There is a woman who likes all men who are not vegetarians.
    - iv) The best score in history was better than the best score in biology.
    - v) Every person who dislikes all vegetarians is smart.
  - b) Perform the minimax algorithm on the tree in figure, first without and later with  $\alpha\beta$  pruning. Can the nodes be ordered in such a way that  $\alpha\beta$ -pruning can cut off more branches?

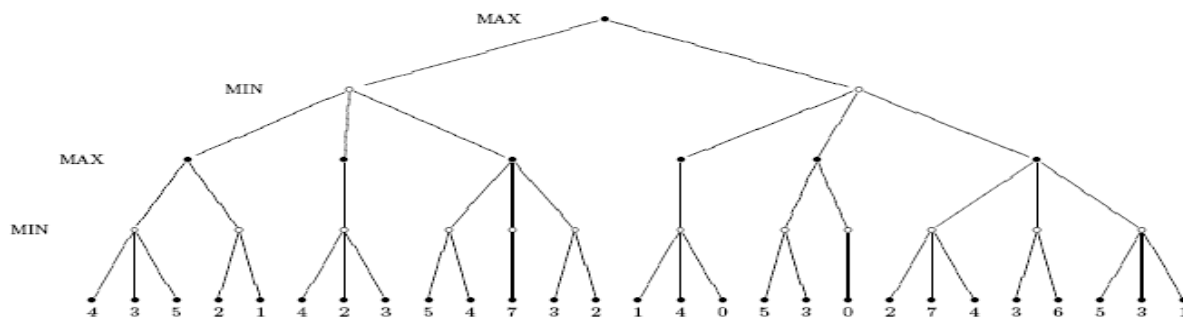


Figure 1: Minimax problem

**(10+8)**

4.

- a) Write the significance of an expert system shell. What are the components of an expert system shell? Give two names of well known expert systems.
- b) What are the syntax and semantic analysis phases in Natural Language processing? Explain any one technique for syntax analysis.
- c) Derive the parse tree for the sentence using the appropriate rules:

*John loves marry.*

**(6+6+6)**

5.

- a) Describe multilayer networks. Show how multilayered perceptron can be used to solve XOR problem.
- b) What is abductive reasoning? Is it valid in propositional logic? When is it used?
- c) The 4-teachers problem. Four teachers, A, B, C and D have to give classes at the same time. To this end, 5 rooms are available, viz. rooms 1, 2, 3, 4 and 5. Teacher A doesn't want to teach in room 1. Teacher B doesn't want to teach in room 2. Teacher D wants to teach in a room with number greater or equal to 3, yet strictly less than the number of the room B is teaching in. Teacher C doesn't want to teach in a room adjacent to that of B (rooms with successive numbers are adjacent), nor in room 5. Obviously, we want to assign different rooms to different teachers. Formulate the above constraint problem in terms of a number of constraints over the variables A, B, C and D and the finite domain {1, 2, 3, 4, 5}. Use Forward Checking to generate a solution to the problem by drawing the search tree. Clearly indicate at each step which elements are removed from the domains.

**(6+6+6)**

6. Write PROLOG/LISP program:

- a) to find maximum number from a list of integers.
- b) for Reversing the elements of a list.
- c) to search an element in the list and to insert an element after a given element in the list.

**(6+6+6)**

7. A problem solving search can proceed either in forward or backward. Whether search should proceed forward or backward for **any three** of the following problems. Justify the answer.

- a) Medical Diagnosis
- b) Natural language Understanding
- c) Planning a Party
- d) Game Playing

**(6+6+6)**