C14-R3: ARTIFICIAL INTELLIGENCE 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) What are the problems with hill climbing search technique? Give solutions to remove these problems.
b) What is production system? List the elements of a production system. Give any two rules of a production system for water jug problem.
c) Introduce monotonic reasoning with example.
d) What is automated knowledge acquisition? If such programs exist, what can be the basic supports they should provide?
e) Give features of Hopfield network also known as theory of memory.
f) Differentiate between supervised and unsupervised learning.
g) What are the different properties of knowledge representation? Explain each in one line only.

(7x4)

2.
a) Trace the execution of the constraint satisfaction procedure in solving the crypt arithmetic problem:

$$\begin{array}{r} \textbf{SEND} \\ + \quad \textbf{MORE} \\ \hline \textbf{MONEY} \end{array}$$

b) Define delta rule and show how it is useful in Back propagation algorithm.

(9+9)

3.
a) Give Conceptual Dependency representation of the following sentence
   `"John died of smoking, Smoking is harmful"`
b) Draw a semantic network for the following sentence:
   `Anil is younger than Sandip and Anil's age is 35 years.`
c) Introduce parsing technique RTN and ATN for natural language understanding.

(6+6+6)

4.
a) What is the architecture of an expert system? Explain different components of an Expert system.
b) Give structure of:
   i)   Single Layer Feed-forward Network
   ii) Multilayer Feed-forward Network and
   iii) Recurrent Network

c) Consider the following set of sentences:
   i) Marcus was a man
   ii) Marcus was a Pompeian
   iii) Marcus was born in 40 A.D.
   iv) All men are mortal
   v) All pompeians died when the volcano erupted in 70 A.D.
   vi) No mortal lives longer than 150 years.
   vii) It is now 2005.
   Answer the following question with the help of proof by resolution:
   Is Marcus alive?

   (6+6+6)

5.
a) Define Frame Based System (FBS) as a knowledge representation technique.
b) Implement FBS using Prolog with inheritance handling.

   (9+9)

6.
a) Write minimax search procedure with alpha-beta pruning strategy.
b) Write Prolog program for reversing a list using difference list concept.
c) Give three situation where cut and fail might be useful.

   (6+6+6)

7.
a) Describe planning with forward state space search.
b) What are the drawbacks of Back-propagation algorithm? How can be solved?
c) Define and explain in detail about the Truth Maintenance Systems.
d) How do scripts are useful in knowledge representation? Give an example.

   (5+5+4+4)