C14-R3: AI AND NEURAL NETWORKS

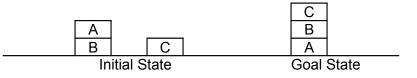**NOTE:**

> 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) Give an instance of the travelling salesperson problem for which the nearest neighbour strategy fails to find an optimal path. Suggest another heuristic for this problem.
b) Indicate the application area where Truth Maintenance System could be applied.
c) Distinguish between abductive inference and inductive inference. Illustrate with examples.
d) Explain fuzzy set theory in brief. Give fuzzy set representation of small integers.
e) With the help of appropriate diagram explain framework symbol based reasoning.
f) Explain supervised hebbian learning network for learning pattern association.
g) Consider the following Block world problem:

Initial State   Goal State

Develop production rules for the above problem. Write 4 steps of the solution.

(7x4)

2.
a) List the operation performed by computer vision system. How an image is transformed into bit pattern.
b) Explain the significance of applying *n ply look- ahead* and *secondary search* with respect to game playing. What will be the optimum value of n in a tic-tac-toe game? Justify your answer.
c) Discuss closed world assumption used for default reasoning. Differentiate between monotonic and non-monotonic reasoning.

(6+6+6)

3.
a) Explain the significance of creation of deep semantic structure. Draw the conceptual dependency representation of following sentences.
   i)   Adwet throws a ball.
   ii) Adwet ran yesterday.
   iii) The plant grew.
b) What are three most fundamental components of production system? What is the purpose of keeping a conflict resolution rule in the productive system?
c) Develop the production system for conventional 8-puzzle problem. Draw the search tree up to 3 levels for the following:

Start:
7	6	4
3		1
2	5	8

Goal:
1	2	3
4	5	6
7	8	9

(6+6+6)

4.

a) How reasoning is performed under uncertain conditions? Use the concept of certainty factor to compute the value of CF, MB, MD for hypothesis *h* given following three observations are made.

CF (h1,o1) = 0.5
CF (h2,o2) = 0.3
CF (h3, 03) = -0.2

b) Find the meaning of following statement
(~P $\vee$ Q) and R $\rightarrow$ S $\vee$ ~R and Q
for each of the interpretations given below.
i)   I1 : P is true, Q is true, R is false, S is true
ii)   I2 : P is true, Q is false, R is true, S is true

c) Develop a script for "food market". What type of questions can be answered by this script. What are the questions that cannot be answered by this script?

(6+6+6)

5.

a) Write complete set of ranks in PROLOG to represent the relation grand father.
b) What is the use of '!' in control search? Give one example.
c) Write a program in PROLOG to search for an element 'X' in the list 'L'.

(6+6+6)

6.

a) Explain the difference between blind search and heuristic search techniques. Explain one technique of each type of search. How does A* algorithm work?
b) What is bi-directional Associative memory? What is meant by "BAM is unconditionally stable"?
c) Analyze the performance of A* algorithm.

(6+6+6)

7.

a) What is the significance of planning in AI systems? Explain the main components of a planning system.
b) Explain the terms modus ponen, modus tollen unification and resolution related to the reasoning systems. Give examples of each.
c) What are various methods of knowledge acquisition in Expert Systems Development?

(6+6+6)