BE2-R4: ARTIFICIAL INTELLIGENCE & NEURAL NETWORKS

NOTE:

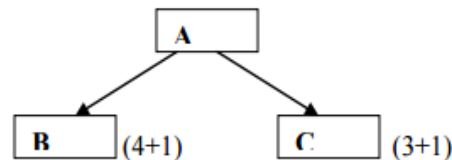> 1. **Answer question 1 and any FOUR from questions 2 to 7.**
> 2. **Parts of the same question should be answered together and in the same sequence.**

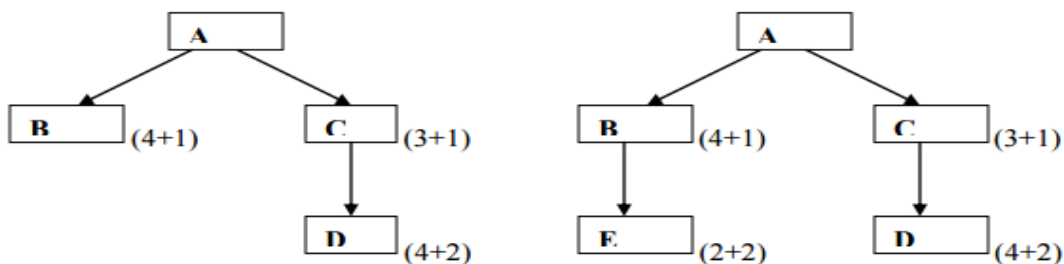**Time: 3 Hours**   **Total Marks: 100**

1.

a)   What are the scientific goals of Artificial Intelligence? List the name of problems those falls into the formal, mundane and expert tasks.

b)   Why is PROLOG called a logic programming language? What is a clausal form? How is it related to Horn Clause and PROLOG? Why PROLOG is Declarative Language?

c)   Explain advantages and disadvantages of Depth First Search and Breadth First Search.

d)   What is Heuristic Search? How to invent Heuristic function for any problem?

e)   Suppose that first step of the operation of the Best-First-Search algorithm results in the following situation (*a + b* means that the value of h' at a node is *a* and the Value of g is *b*).

The second and third step then results in the following sequence of situations:

    i)   What node will be expanded at the next step?
    ii)   Can we guarantee that the best solution will be found?

f)   Explain Knowledge Representation Issues. Explain limitations of Knowledge Representation?

g)   Differentiate simple Hill Climbing and Steepest-Ascent Hill Climbing. Write down Algorithm for Simple Hill climbing.

                                                                                                              (7x4)

2.

a)   Explain semantic Nets in terms of Knowledge Representation. What do you mean by Inheritance Reasoning and Inverse Link? State advantages and disadvantages of Semantic Nets.

b)   Consider the following sentences.
    'John likes all kinds of food'
    'Apples are food'
    'Chicken is food'
    'Anything anyone eats and isn't killed by its food'
    'Bill eats peanuts and is still alive'
    'Sue eats everything Bill eats'

i)   Translate these sentences into formulas in Predicate Logic.
ii)   Prove that John likes peanuts using backward chaining.
iii)   Convert the formulas of part a into clause form.

(9+[3x3])

3.
a)   Draw architecture of Knowledge Based system. Explain in detail core components of Knowledge Based System.
b)   Explain Bayes' theorem for conditional probability. Explain why is bayes' theorem intractable?

(9+9)

4.
a)   Explain AO* Algorithm.
b)   What are components of Natural Language Processing? Explain each in detail.

(9+9)

5.
a)   Consider the sentence:
'The old man's glasses were filled with sherry.'
What information is necessary to choose the correct meaning for the word "glasses"? What information suggests the incorrect meaning?
b)   Draw and explain architecture of Artificial Neural Network. What is output and input for Artificial Neural Network? What are the advantages of Neural networks over conventional computers?
c)   What is/are the role(s) of Knowledge Engineers? Also explain difficulties in knowledge acquisition?

(6+6+6)

6.
a)   Explain Hopfield network. Also explain its applications. Hopfield networks are most often used for auto-association. What does that mean, and why can this be useful at all? Please explain how it can be shown that for a constant input, Hopfield networks are guaranteed to reach a stable state after a finite number of iterations. You do not have to write down any equations, but just describe the concepts that are introduced and why they prove this property of Hopfield networks.
b)   What problem could occur in Self Organizing Maps learning if you use a very small neighborhood? Why? Self Organizing Maps can reduce the dimensionality of a given data space. Explain what that means. Write a short note on Kohonen's self Organizing Networks.
c)   Explain Delta rule for learning.

(8+6+4)

7.
a)   What do you understand by supervised learning and unsupervised learning? Explain. Discuss any unsupervised learning algorithm with some examples.
b)   What do you mean by Turing Test? How it can be performed?

(9+9)