Roll No.:.....

National Institute of Technology, Delhi

Name of the Examination: B. Tech. /M.Tech/PhD

Branch	: EEE	Semester	: 7th
Title of the Course	: AI Techniques in EE	Course Code	: EE416

Time: 3 Hours

Maximum Marks: 50

Guidelines:

The question paper is divided into three sections A, B and C and each section has following type of questions

a. **Section A: Carry only one (01) question of 10 parts of 01 mark each and all parts are compulsory.**

b. **Section B: Contains Five (05) questions of 5 marks each and any four (04) are to be attempted.**

c. **Section C: Contains Three (03) questions of ten (10) marks each and any two (02) are to be attempted.**

SECTION-A

1. Draw the structure of a biological neuron?
2. Define bias and threshold in context of ANN.
3. Differentiate supervised learning and unsupervised learning.
4. What are semantic networks?
5. What do you mean by Heuristic Search?
6. What is one-point cross-over in GA?
7. Compare Fuzzy Logic and ANN.
8. Define membership function in fuzzy logic.
9. List the different types of operators used in Genetic Algorithm?
10. What is mutation in GA?

SECTION-B

1. Write short notes on:
   a) Relational Knowledge
   b) Inheritable Knowledge
   c) Procedural Knowledge
   d) Inferential Knowledge
   e) Predicate Logic

2. Realize OR function by McCulloch-Pitts neuron model.
3. Show how a multi-layered perceptron solves a non-linear separable class problem.
4. Define de-fuzzification in fuzzy inference system. Describe any two de-fuzzification method with examples.
5. Explain the working principle of Genetic Algorithm. Discuss the applications as well.

SECTION-C

1. (a) Give an example of a problem for which breadth first search would work better than depth first search.

   (b) What is fuzzy controller? Explain the basic structure of the fuzzy controller with block diagram.

2. Consider the fuzzy sets A and B defined on the interval X = [0,5] of real numbers, by the membership grade functions

$$\mu_A(x) = \frac{x}{x+1}; \quad \mu_B(x) = 2^{-x}$$

   Determine the mathematical formulae and graphs of the membership grade functions of each of the following sets

   (a) A^c, B^c (b) AUB (c) A∩B (d) $(AUB)^c$

3. (a) Explain the principle of Fuzzy Neural Network (FNN). Describe the various steps involved in designing of FNN.

   (b) What is Artificial Intelligence? Explain how an AI system is different from a conventional computing system?