No. of Printed Pages : **2**

Sl. No.

C9-R4 : SOFT COMPUTING

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.

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

1. (a) Distinguish between supervised learning and unsupervised learning.

(b) Define Soft Computing. Distinguish between Soft Computing and Hard Computing.

(c) What are the various types of cross over techniques ?

(d) Explain hypothesis space in details.

(e) Using McCulloh-Pitts neuron model, design a neural network for 2-input OR functions.

(f) How is fuzzy relation converted into a crisp relation using lamda-cut approach ? Explain with the help of a suitable example.

(g) What is hybrid system in soft computing ? Why we should do hybridization ? List the type of hybrid system and its application domain. **(7x4)**

2. (a) Explain the working of back propagation neural network with a neat architecture.

(b) Discuss difference between genetic algorithm and other traditional methods.

(c) What are the applications of Genetic algorithm ? **(10+4+4)**

3. (a) Explain four de fuzzification methods.

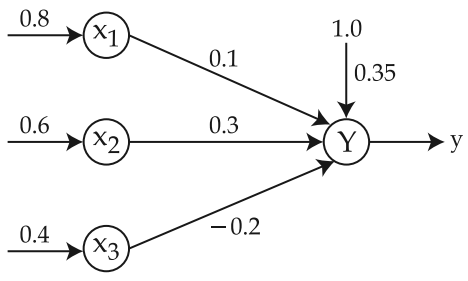
(b) Define Fuzzy inference system and with the help of necessary block diagrams. Also, compare Mamdani and Sugeno Fuzzy Inference System. **(8+10)**

4. (a) Describe basic models of Artificial Neural Networks specified by connections and activation functions.

(b) Obtain the output of the neuron Y for the network shown in figure below using activation functions as :

(i) Binary Sigmoidal

(ii) Bipolar Sigmoidal



(10+8)

5. (a) Name and describe the main features of Genetic Algorithms (GA).

(b) Suppose a genetic algorithm uses chromosomes of the form $x = \text{abcdefgh}$ with a fixed length of eight genes. Each gene can be any digit between 0 and 9. Let the fitness of individual x be calculated as : $f(x) = (a + b) - (c + d) + (e + f) - (g + h)$, and let the initial population consist of four individuals with the following chromosomes :

$x1 = 6\ 5\ 4\ 1\ 3\ 5\ 3\ 2$

$x2 = 8\ 7\ 1\ 2\ 6\ 6\ 0\ 1$

$x3 = 2\ 3\ 9\ 2\ 1\ 2\ 8\ 5$

$x4 = 4\ 1\ 8\ 5\ 2\ 0\ 9\ 4$

(I) Evaluate the fitness of each individual showing all the steps and arrange them in order with the fittest first and the least fit last.

(II) Perform the following crossover operations :

(i) Cross the fittest two individuals using one point crossover at the middle point.

(ii) Cross the second and third fittest individuals using a two point crossover (point's b and f).

(iii) Cross the first and third fittest individuals (ranked 1st and 3rd) using a uniform crossover.

(III) Suppose the new population consists of the six offspring individuals received by the crossover operations in the above question. Evaluate the fitness of the new population, showing all your workings. Has the overall fitness improved. **(8+10)**

6. (a) Draw the five layer architecture of ANFIS and explain each layer in brief.

(b) Define Reinforcement Learning . What are different types of Reinforcement learning ? Explain Various Practical applications of Reinforcement Learning.

(c) Explain Recursive Least Squares Estimators. **(6+6+6)**

7. (a) Differentiate between Derivative based and Derivative free optimization.

(b) Write short notes on the following :

(i) Neuro Fuzzy Hybrid Systems

(ii) Neuro Genetic Hybrid Systems

(iii) Fuzzy Genetic Hybrid Systems **(6+12)**

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