Neural Networks & Fuzzy Systems

Con. 5378-09. (REVISED COURSE) BE–6134

( 3 Hours) (4) [Total Marks : 100

N. B. : (1) Question No. 1 is **compulsory**.
(2) Attempt any **four** questions out of the **remaining**.

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Q.1 (a) A neuron with 4 inputs has the weight vector $w = [1, 2, 3, 4]^t$. The activation function is linear, that is, the activation function is given by f(net) = net. If the input vector is $X = [5, 6, 7, 8]^t$, then find the output of the neuron. 05

(b) Model the following as fuzzy set using suitable membership function - "numbers close to 5". 05

(c) Define with examples the terms Projection and Cylindrical Extension in a fuzzy relation. 05

(d) Differentiate between the membership functions T function and Zadeh's S function. 05

Q.2 Design a fuzzy controller to determine the wash time of a domestic washing machine. Assume that the inputs are dirt and grease on clothes. Use three descriptors for each input variable and five descriptors for the output variable. Device a set of rules for control action and defuzzification. The design should be supported by figures wherever possible. Clearly indicate that if the clothes are soiled to a smaller degree the wash time required will be less. 20

Q.3 (a) What is learning in neural networks? Compare different learning rules. 10

(b) Explain error back propagation training algorithm with the help of a flowchart. 10

Q.4 Determine the weights after three iterations for hebbian learning of a single neuron network starting with initial weights w = [1,-1], inputs as X1 = [1,-2], X2 = [2,3], X3 = [1,-1] and c = 1.

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Use (i) Bipolar binary activation function
(ii) Bipolar continuous activation function 20

Q.5 (a) Describe the basic Hopfield model and give the theory of energy minimization in auto-associative Hopfield network. 10

(b) Explain the architecture of Bidirectional associative memory. How is storage and retrieval performed in BAM? 10

Q.6 (a) What is competitive learning? Explain winner take all learning rule and self-organizing map with the help of an example. 10

(b) Explain with suitable examples linearly and non-linearly separable pattern classification. 10

Q.7 Write notes on **any two** of the following 20

(i) Fuzzy Knowledge based Controller
(ii) Defuzzification Methods
(iii) Character recognition using neural networks
(iv) Medical diagnosis using neural networks

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