46 : 1st half.11-AM(n)

Con. 3771-11. (REVISED COURSE) RK-4638

(3 Hours) [Total Marks : 100

N.B. : (1) Question No. **1** is **compulsory**.
(2) Attempt any **four** question out of remaining **six** questions.
(3) **Assumption** made must be **clearly stated**.

1. Solve any **four** of the following :— 20
   (a) Show that any λ-cut relation (for $\lambda > 0$) of a Fuzzy tolerance relation results in a crisp tolerance relation.
   (b) Explain common activation function used in neural network.
   (c) Distinguish between Supervised and Unsupervised Training.
   (d) Compare LMS and Perceptron Learning Laws.
   (e) Explain Delta learning rule.
   (f) What are the salient features of Kohonen's self-organizing learning algorithm ?

2. (a) State and explain the basic learning laws. 10
   (b) Explain perceptron learning rule convergence theorem. Design a perceptron 10 network to implement an AND function, take first input sample [1, 1, 1]

3. (a) Derive the back propagation training algorithm for an arbitrary activation function. 8
   (b) How can you approximate a Gaussian function by two sigmoid function ? How 8 can you translate a radial basis function network in to a back propagation network ?
   (c) How do we achieve fast learning in ART 2 network ? 4

4. (a) What is the Hopfield model of a neural network ? Explain its algorithm and 10 differentiate between discrete and continuous Hopfield model in terms of energy landscape and stable state.

   (b) Two Fuzzy sets A define on X and B define on Y 10

   $$A = \left\{ \frac{1}{LS} + \frac{0\cdot4}{MS} + \frac{0\cdot2}{HS} \right\}$$

   $$B = \left\{ \frac{1}{SRR} + \frac{0\cdot5}{MRR} + \frac{0\cdot25}{FRR} \right\}$$

   (i) Find the Fuzzy relation for Cartesian product of A and B

   (ii) For another Fuzzy set C define on X

   $$C = \left\{ \frac{0\cdot1}{LS} + \frac{0\cdot3}{MS} + \frac{1}{HS} \right\}$$

   Find relation between C and B using Cartesian product.

   (iii) Find $C \circ R$ using max-min and max-product composition.

[**TURN OVER**

5. (a) Show that any λ-cut relation (For $\lambda > 0$) of Fuzzy tolerance relation results in a   10
         crisp tolerance relation and any λ-cut relation (for $\lambda > 0$) of a Fuzzy equivalence
         relation results in a crisp equivalence relation.

    (b) What is self organizing map ? Explain structure and algorithm of Kohonen self   10
         organizing map.

6. (a) Explain Brain-state-in-a-box model and explain how it is used for clustering ?   8
    (b) For the given network   8
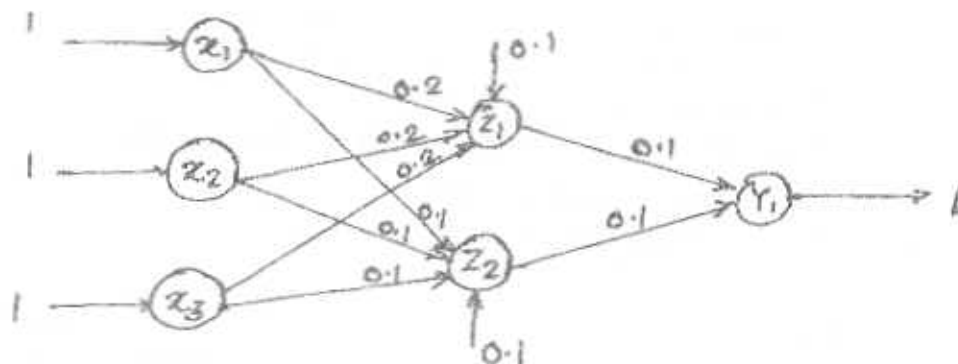
         Find new weights when net is presented the input pattern (1, 1, 1) and target
         output is '1'. Use learning rate of 0·1 and bipolar sigmoidal activation function,
         the bias is set to '1'.

         Activation function : $f(x) = \dfrac{2}{1+e^{-x}} - 1$ and $f'(x) = 0·5\,(1 + f(x))\,(1 - f(x))$

    (c) Explain Mc-culloch and pitts model of neuron.   4

7. (a) State and explain various method of defuzzification.   10
    (b) Write short notes on the following :—   10
             (i) Fuzzy Controller
             (ii) Least mean square algorithm.