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Total Number of Pages: 2

**M.TECH**  
**CSPE 102**

## First Semester Regular/Back Examination – 2015-16

### COMPUTATIONAL INTELLIGENCE

Branch-CSE

Time: 3 Hours

Max marks: 70

Q.Code-T1114

Answer Question No.1 which is compulsory and any five from the rest.

The figures in the right hand margin indicate marks.

- Q1 Answer the following questions: (2 x 10)
- a) Draw the genetic algorithm process cycle.
  - b) Mention the importance of gradient descent learning rule used in back propagation neural network.
  - c) State the advantages of associative memory.
  - d) The performance of GA depends on the balance between selection process and population diversity- Justify the statement.
  - e) What is LR-type fuzzy numbers?
  - f) Justify the following statement  
“Approximate reasoning is important in fuzzy logic.”
  - g) Why do we use high crossover probability value and low mutation probability value in a genetic algorithm?
  - h) Differentiate between fuzzy-neural hybrid and fuzzy-genetic hybrid system.
  - i) State generalized modus ponens and generalized modus tollens.
  - j) Define Delta Rule.
- Q2 a) Implement a perceptron network for an OR function with bipolar input and targets. Assume necessary parameters. Perform one epoch of training. (5)
- b) Explain various activation functions and learning rules used in neural network architecture. (5)
- Q3 a) With a neat architecture, explain the training algorithm of back propagation network. (5)
- b) Write notes on auto-correlators and hetero-correlators. (5)
- Q4 a) What is ANFIS? With a suitable block diagram explain its architecture and working principle. (5)
- b) Using genetic algorithm process, minimize the function  $f(x)=x^2$ . Assume the necessary operators for the process of your own. (5)
- Q5 Explain various types of mutation and cross over techniques used in the genetic algorithm process. (10)

- Q6 A Kohonen self-organizing map is shown with weight in the Fig. 1 (10)
- Using the square of the Euclidean distance, find the cluster unit  $C_J$  that is closest to the input vector (0.3, 0.4)
  - Using a learning rate of 0.3, find the new weights for unit  $C_J$ .
  - Find new weights for  $C_{J-1}$  and  $C_{J+1}$  even if they are allowed to learn.

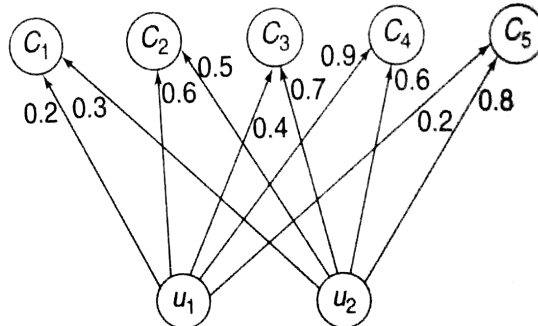


Figure 1

- Q7 a) What is Fuzzy Inference System (FIS)? Briefly explain about Sugeno and Tsukamoto fuzzy models . (5)

- b) (5)

Let  $X = \{a, b, c, d\}$ ,  $Y = \{1, 2, 3, 4\}$

And  $\tilde{A} = \{(a, 0) (b, 0.6) (c, 0.7) (d, 1)\}$

$\tilde{B} = \{(1, 0.3) (2, 1) (3, 0.9) (4, 0)\}$

$\tilde{C} = \{(1, 0) (2, 0.3) (3, 1), (4, 0.6)\}$

Determine the implication relations

(i) IF x is  $\tilde{A}$  THEN y is  $\tilde{B}$  .

(ii) IF x is  $\tilde{A}$  THEN y is  $\tilde{B}$  ELSE y is  $\tilde{C}$

- Q8 Write short notes on any two of the following: (5 x 2)

- Defuzzification
- Fitness Function
- Fuzzy Rule based Systems
- Continuous BAM Vs Discrete BAM.