

Seat No.: \_\_\_\_\_

Enrolment No. \_\_\_\_\_

**GUJARAT TECHNOLOGICAL UNIVERSITY**  
**ME Semester –III Examination Dec. - 2011**

**Subject code: 730103**

**Date: 08/12/2011**

**Subject Name: Soft Computing**

**Time: 10.30 am – 01.00 pm**

**Total Marks: 70**

**Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

- Q.1** (a) Explain various architectures of ANN in brief. What are learning methods to train the ANN? **07**
- (b) How GA differs from conventional algorithms? Explain each step of solving any problem using GA. **07**

- Q.2** (a) What do you mean by hybrid systems? How they are classified? Briefly explain any one hybrid system. **07**
- (b) 1. What is the effect of following parameters on the working of backpropagation network? **04**
- (i) No. of hidden nodes (ii) Momentum coefficient ( $\alpha$ )  
(iii) Sigmoidal gain ( $\lambda$ ) (iv) Learning coefficient ( $\eta$ )
2. What is advantage of logarithm and exponent neuron? **03**

**OR**

- (b) 1. Briefly explain model of an artificial neuron. **03**
2. Explain simple perceptron and multilayer feedforward perceptron model. What is limitation of perceptron? **04**

- Q.3** (a) Given patterns **07**
- A1=(000111001) B1=(010000111)  
A2=(110110101) B2=(101001010)  
A3=(111001110) B3=(100000001)
- Use bidirectional associative memory proposed by kosko to check whether
- (i) B2 is recalled from A2?  
(ii) B3 is recalled from A3?  
If yes then how?

- (b) Given two fuzzy sets *tall* and *medium* with universal set X as follows. **03**
- X = {Jay, Jasmin, Raj, Riya}
- tall* = {(Jay,0.2), (Jasmin,0.5), (Raj,0.7)}
- medium* = {(Jay,0.8), (Jasmin,0.8), (Riya,0.9)}
- (i) Find difference and disjunctive sum of *tall* and *medium*. **03**
- (ii) Prove that  $(tall \cup medium)' = tall' \cap medium'$  and  $(tall \cup tall') \# X$  **04**

**OR**

- Q.3 (a)** 1. Explain fuzzy quantifiers and fuzzy inference. **03**  
 2. Let the two universal sets are **04**  
 temperature = {30, 40, 50, 60, 70, 80, 90, 100}  
 pressure = {5, 7, 9, 11, 15, 17}

fuzzy sets correspondence to temperature are  
*high* = {(50,0.7), (60,1), (70,1), (80,0.6), (90,0.3)}  
*very high* = {(70,0.7), (80, 0.9), (90,1), (100,1)}

and fuzzy sets correspondence to pressure are  
*medium* = {(5,0.3), (7,0.9), (9,0.8), (11,0.2)}  
*low* = {(5,1), (7,0.6), (9,0.1)}

Find fuzzy relation for given two implications.

- (i) If temperature is *high* then pressure is *medium*.  
 (ii) If temperature is *high* then pressure is *medium* else pressure is *low*.

- (b)** Let three fuzzy sets X, Y, Z are as follows. **07**  
 $X = \{(1,0), (2,0.45), (3,0.45), (4,0)\}$   
 $Y = \{(3,0), (4,0.8), (5,0.8), (6,0)\}$   
 $Z = \{(5,0), (6,1), (7,1), (8,0)\}$   
 Find defuzzified output of aggregated fuzzy sets X, Y, Z using centroid method.

- Q.4 (a)** Explain various parent selection methods used in GA. **07**  
**(b)** Explain single point, two point, multi point and uniform cross over **07**  
 with suitable example.  
 Perform uniform cross over using mask on given pair of chromosomes.  
 $P1 = 1\ 0\ 1\ 0\ 0\ 0\ 1\ 1\ 1\ 0\ 1$   $P2 = 0\ 1\ 0\ 1\ 0\ 1\ 0\ 0\ 1\ 1\ 0$   
 Mask = 1 0 0 1 0 1 1 1 0 0 1.

**OR**

- Q.4 (a)** 1. Differentiate exploration and exploitation. What is effect of cross **03**  
 over and mutation on them?  
 2. What is multi level and multi modal optimization? **04**  
**(b)** Suppose a 3-5-1 BPN has all 20 weights are randomly initialized. The **07**  
 goal is to optimize the set of weights to reduce MSE. Show just steps  
 how GA can be used to get optimized weights?

- Q.5 (a)** What do you mean by LR type fuzzy numbers? What are its **07**  
 applications? Explain architecture of fuzzy backpropagation network.  
**(b)** Let the two universal sets temperature, pressure and four fuzzy sets **07**  
*high, very high, medium, low* are defined as in Q:3 (a) above. A FAM  
 bank comprising of two rules:  
 R1: If temperature is *high* then set pressure to *medium*.  
 R2: If temperature is *very high* then set pressure to *low*.

If given temperature is 85, draw aggregated fuzzy set correspondence to outputs of both rules R1 and R2.

**OR**

- Q.5 (a)** Mention the situations when to use GA for application? What are **07**  
 benefits of GA?  
**(b)** What are variations of standard back propagation algorithms? **07**

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