

**Elective - I : Fuzzy Logic and Neural Networks**

P. Pages : 2

Time : Three Hours



**TKN/KS/16/7549**

Max. Marks : 80

- Notes :
1. All questions carry marks as indicated.
  2. Solve Question 1 OR Questions No. 2.
  3. Solve Question 3 OR Questions No. 4.
  4. Solve Question 5 OR Questions No. 6.
  5. Solve Question 7 OR Questions No. 8.
  6. Solve Question 9 OR Questions No. 10.
  7. Solve Question 11 OR Questions No. 12.
  8. Due credit will be given to neatness and adequate dimensions.
  9. Assume suitable data whenever necessary.
  10. Illustrate your answers whenever necessary with the help of neat sketches.
  11. Use of non programmable calculator is permitted.

1. a) Given two fuzzy numbers A and B whose membership functions are given by - **8**
- $$\begin{aligned} A(x) &= (x+2)/2 & ; & \quad \text{for } -2 < x \leq 0 \\ &= (2-x)/2 & ; & \quad \text{for } 0 < x < 2 \\ &= 0 & ; & \quad \text{otherwise} \end{aligned}$$
- $$\begin{aligned} B(x) &= (x-2)/2 & ; & \quad \text{for } 2 < x < 4 \\ &= (6-x)/2 & ; & \quad \text{for } 0 < x \leq 6 \\ &= 0 & ; & \quad \text{otherwise} \end{aligned}$$
- Calculate the fuzzy numbers (A + B), (A - B), (B - A), (A . B) and (A/B)
- b) Explain the following terms with example - **6**
- i) Randomness.
  - ii) Ambiguity.

**OR**

2. a) Prove the following statements : **8**
- i) Every fuzzy complement has atmost one equilibrium.
  - ii) JFC is a continuous fuzzy complement then C has unique equilibrium.
- b) Explain design approaches for adaptive fuzzy controller. **6**
3. a) Explain Center of Gravity (COG) defuzzification method. **6**
- b) Distinguish between linear and non linear system on the basis of superposition and homogeneity properly. **7**

**OR**

4. a) What are the types of FKBC, Explain any one in detail. **7**
- b) Enlist and explain any one application of FLC from industrial perspective. **6**

5. a) Explain in short the defuzzification bisector method for discrete type of fuzzified output sets. 7  
 b) Explain with block diagram, the structure of fuzzy knowledge base controller. 7
- OR**
6. Write short notes on :
- i) T-norms and T-conorms. 4  
 ii) Law of exclusive middle and absorption. 5  
 iii) Model based adaptive fuzzy controller. 5
7. a) Explain in brief supervised and unsupervised learning. 7  
 b) Draw three layer feed forward ANN model. 6
- OR**
8. Explain and derive the back propagation algorithm for multilayer neural network. 13
9. a) Explain Hamming network - 10 calculate the Hamming distance between stored vectors and input-vectors to conduct un supervised learning. 7  
 b) Obtain OR gate logic function for two input OR gate using single node perception algorithm. Assume initial weight as zero show classification graphically. 6  
 Assume  
 $x_0 = -1$   $f(x) = +1$  ; for  $s \geq 0$   
 $F(s) = -1$  for  $s > 0$
- OR**
10. Write short notes on :
- i) Models of ANN. 4  
 ii) Storage capacity of Hopfield Network. 4  
 iii) Sigmoid function. 5
11. a) Write a short note on storage capacity of Hopfield network. 6  
 b) Write a short note on Bidirectional associative memory illustrate with suitable example. 7
- OR**
12. Write short note on :
- i) ART Networks. 4  
 ii) MAXNET 4  
 iii) Hidden Layers. 5

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