MODEL QUESTION

Fifth Semester B.Tech Degree

(2013 scheme)

13.506.2 FUZZY SYSTEMS AND APPLICATIONS (AT)

Time: 3 Hours Max. Marks : 100

PART – A

(Answer all questions. Each question carries 2 marks.)

1. Define alpha cut, strong alpha cut sets and level sets of a give fuzzy set.
2. Derive cardinality and relative cardinality of a fuzzy set.
3. Obtain the subset hood and equality measures S(A,B) and E(A,B) among the following fuzzy sets
   a. A = 0.1/0.1 + 0.2/0.2 + 0.3/0.3 + 0.4/0.4 + 0.5/0.5
   b. B = 0.2/0.1 + 0.2/0.2 + 0.4/0.3 + 0.4/0.4 + 0.6/0.5
4. Define Reflexivity and symmetry of a binary fuzzy relation on a single set.
5. What are fuzzy propositions?
6. Explain a fuzzification method.
7. Draw the typical architecture of an FLC
8. List the advantages fuzzy logic control systems.
9. What are fuzzy singleton rules?
10. What is fuzzy operator tuning?

PART – B

(Answer any one question from each Module. Each question carries 20 marks)

Module – I

11.
   a. Draw the profile of membership function for a fuzzy set called “Tall men”. Take your own values for different heights.
   b. Describe the different properties of fuzzy sets. Prove whether the laws of excluded middle and contradiction true for fuzzy sets.
   c. What are type2 fuzzy sets? Give example.

12.
   a. Let fuzzy sets A and B be given as A = 0.5/3 + 1/5 + 0.6/7 + 0.8/8 and B = 1/3 + 0.5/5 + 0.1/7 + 1/8 where the universe of discourse being X = {3, 5, 7, 8}. Now obtain the following:
      i. A + B , the Algebraic Sum
      ii. A.B , the Algebraic Product
      iii. S (A,B) the subset hood measure
      iv. E (A,B) the equality measure.
   b. Define Dilation, Concentration and Contrast intensification on fuzzy sets.
   c. Given two fuzzy sets X and Y. Prove
      1. CON(X U Y) =CON (X) U CON(Y)
      2. CON(X Ω Y) = CON(X) Ω CON(Y)

Module – II

13.

a. Given a binary fuzzy relation R(X,Y)

$$R(X,Y) = \begin{matrix} 0.1 & 1 & 0.5 & 0 \\ 0.2 & 0.5 & 1 & 0.4 \\ 0 & 0.3 & 0.9 & 0.5 \\ 0.1 & 0.2 & 0 & 0.7 \end{matrix}$$

i. Obtain the domain of R.
ii. Obtain the range of R.
iii. What is the height of R.
iv. Obtain inverse of R.
v. Obtain R $^{\circ}$ R and R $'$ R
vi. Express R(X ,Y) in its resolution form.

b. Define max min transitivity of a binary fuzzy relation.

14.

a. Prove that the max-min composition on a binary fuzzy relation is associative.
b. Explain with example Linguistic variables and Hedges
c. Let X= $\{x1, x2, x3$ } and {y1,y2 } and R = $\begin{bmatrix} 0.1 & 0 \\ 0.5 & 0.6 \\ 0.7 & 0.9 \end{bmatrix}$ Obtain projections and Cylindrical extensions R on to Y and R onto X.

Module – III

15.

a. With the help of a block diagram explain the working of a fuzzy logic air conditioner controller.
b. Write notes on types and applications of FLCs

16.

a. Write notes on Fuzzy rule formats.
b. Explain MIMO control systems.
c. Explain PID controllers

Module – IV

17. Explain the Neural fuzzy controller with hybrid structure and parameter learning.

18.

a. Write notes on ANFIS
b. Explain Neural fuzzy controller with TSK fuzzy rules