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Reg. No. : .....

Name : .....

Fifth Semester B.Tech. Degree Examination, November 2013
(2008 Scheme)
08.516 : FUZZY SYSTEMS AND APPLICATIONS (TA)

Time : 3 Hours Max. Marks : 100

PART – A

Answer **all** questions.

1. Obtain all possible α cuts for the fuzzy set B

$$B = \left\{\frac{0.1}{2} + \frac{0.4}{4} + \frac{0.6}{6} + \frac{0.9}{8} + \frac{1}{10}\right\}$$

2. Fuzzy sets

$$A = \frac{0.1}{1} + \frac{0.2}{2} + \frac{0.3}{3} + \frac{0.4}{4} + \frac{0.5}{5}$$

$$B = \frac{0.2}{1} + \frac{0.2}{2} + \frac{0.4}{3} + \frac{0.4}{4} + \frac{0.6}{5}$$ obtain the subset hood and equality measures.

3. Fuzzy sets

$$T = \left\{\frac{0}{0} + \frac{0.3}{1} + \frac{0.7}{2} + \frac{0.8}{3} + \frac{0.9}{4} + \frac{1}{5}\right\}$$

$$R = \left\{\frac{0}{0} + \frac{0.1}{1} + \frac{0.2}{2} + \frac{0.3}{3} + \frac{0.4}{4} + \frac{0.5}{5}\right\}$$ prove demorgans laws.

4. Explain type 2 Fuzzy systems. Give examples.

5. Let A and B be fuzzy sets defined on universe of discourse X.

$\mathcal{L}A(x) = \frac{0.5}{-1} + \frac{1}{0} + \frac{0.5}{1} + \frac{0.3}{2}$ and $\mathcal{L}B(x) = \frac{0.5}{2} + \frac{1}{3} + \frac{0.5}{4} + \frac{0.3}{5}$. Let function f defined for all $x_1, x_2 \in X$. $f(x_1, x_2) = (x_1 + x_2)$, calculate f (A, B).

P.T.O.

6. Let the liquistic variable small $= \left\{\frac{1}{1}+\frac{0.8}{2}+\frac{0.6}{3}+\frac{0.4}{4}+\frac{0.2}{5}\right\}$ find very small, intensively small.

7. Let a fuzzy relation $R(x,y)=\begin{bmatrix}0.2 & 1\\ 0 & 0.4\\ 0.8 & 0\end{bmatrix}$ express R in resolution form.

8. State and explain Generalized Modus Ponens (GMP) and Generalized Modus Tollens (GMT).

9. Explain Multi Input Multi output Fuzzy control system.

10. Explain the advantages of Fuzzy control system. **(10×4=40 Marks)**

PART – B

Answer **any two** from **each** Module.

Module – I

11. a) State and prove De-Morgans laws.

    b) State the law of excluded middle, law of contradiction. Check their validity for fuzzy sets.

12. a) Define dialation, concentration and contrast intensification.

    b) For fuzzy sets A and B. Prove

       i) $INT(A \cup B) = INTA \cup INTB$

       ii) $INT(A \cap B) = INTA \cap INTB$

    c) Let $A = \frac{0.5}{3}+\frac{1}{5}+\frac{0.6}{7}+\frac{0.8}{8}$ find CON(A), DIL(A).

13. a) Define equilibrium of a fuzzy set obtain the equilibrium of λ complement (sugeno) and co-complement (Yager complement).

    b) Prove that the yager complement reduces to fuzzy complement as $w \to 1$.

Module – II

14. a) Obtain the domain, range, height and inverse of the matrix R

$$R = \begin{bmatrix} 0.5 & 1 & 0.9 \\ 0.7 & 0 & 0.8 \\ 1 & 0.9 & 0.3 \end{bmatrix}$$

b) Also obtain the min-max, max-min compositions.

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

and $A = \{(a, 0), (b, 0.8), (c, 0.6), (d, 1)\}$

$B = \{(1, 0.2), (2, 1), (3, 0.8), (4, 0)\}$

$C = \{(1, 0), (2, 0.4), (3, 1), (4, 0.8)\}$

Determine the implication relation.

i) IF x is A THEN y is B.

ii) IF x is A THEN y is C.

b) Explain fuzzy rule base system.

16. State and explain defuzzification methods :

a) Centroid method

b) Centre of sums method.

Module – III

17. a) Explain the working of Fuzzy logic controllers.

b) Explain different types of rule formats.

18. Discuss the application of fuzzy logic control in controlling air craft landing system.

19. Explain the principle of fuzzy pattern recognition. What are its merits ?

(6×10=60 Marks)