(Pages : 4) **6867**

Reg. No. : .....

Name : .....

Eighth Semester B.Tech. Degree Examination, December 2013
(2008 Scheme)
08.805 (1) : FUZZY SET THEORY AND APPLICATIONS (Elective – III) (R)

Time : 3 Hours Max. Marks : 100

PART – A

Answer **all** questions.

1. Explain the properties of fuzzy sets.
2. Explain cosine amplitude method.
3. Define normal, convex fuzzy sets with examples.
4. Write a note on inductive reasoning.
5. What is meant by fuzzy logic ?
6. Write a short note on Linguistic hedges.
7. Explain the purpose of inference engine.
8. Write a short note on fuzzy expert system.
9. Write a note on fuzzy databases.
10. Explain fuzzy syntactic method. **(10×4=40 Marks)**

P.T.O.

PART – B

Module – I

11. a) Let $\underset{\sim}{A} = \left\{\frac{1}{2} + \frac{0.5}{3} + \frac{0.3}{4} + \frac{0.2}{6}\right\}$, $\underset{\sim}{B} = \left\{\frac{0.5}{2} + \frac{0.7}{4} + \frac{0.2}{5} + \frac{0.4}{6}\right\}$ and $\underset{\sim}{C} = \left\{\frac{0.1}{2} + \frac{0.2}{3} + \frac{0.3}{4} + \frac{0.2}{6}\right\}$ be fuzzy sets.

Calculate :

i) $\overline{\underset{\sim}{A} \cup \underset{\sim}{B}}$ ii) $\underset{\sim}{A} \cap \overline{\underset{\sim}{C}}$

iii) $\overline{\underset{\sim}{A}} \cup \underset{\sim}{B} \cap \underset{\sim}{C}$ iv) $A \cap \overline{\underset{\sim}{B} \cup \underset{\sim}{C}}$ **10**

b) Consider the following fuzzy relations $R \in X \times Y$, $S \in Y \times Z$,

where $X = \{30, 60, 100, 120\}$, $Y = \{20, 40, 60, 80, 100, 120\}$ and

$Z = \{500, 1000, 1500, 1800\}$

$$\underset{\sim}{R} = \begin{array}{c} \\ 30 \\ 60 \\ 100 \\ 120 \end{array} \begin{array}{c} \begin{array}{cccccc} 20 & 40 & 60 & 80 & 100 & 120 \end{array} \\ \begin{bmatrix} 0.2 & 0.3 & 0.3 & 0.3 & 0.3 & 0.1 \\ 0.3 & 0.4 & 0.6 & 0.7 & 0.7 & 0.2 \\ 0.2 & 0.4 & 0.6 & 0.8 & 1.0 & 0.1 \\ 0.2 & 0.2 & 0.2 & 0.2 & 0.2 & 0.3 \end{bmatrix} \end{array}$$

$$\underset{\sim}{S} = \begin{array}{c} \\ 20 \\ 40 \\ 60 \\ 80 \\ 100 \\ 120 \end{array} \begin{array}{c} \begin{array}{cccc} 500 & 1000 & 1500 & 1800 \end{array} \\ \begin{bmatrix} 0.2 & 0.2 & 0.2 & 0.15 \\ 0.33 & 0.4 & 0.4 & 0.15 \\ 0.33 & 0.6 & 0.6 & 0.15 \\ 0.33 & 0.67 & 0.8 & 0.15 \\ 0.33 & 0.67 & 1.0 & 0.15 \\ 0.1 & 0.1 & 0.1 & 0.1 \end{bmatrix} \end{array}$$

Construct the relation $\underset{\sim}{T} \in X \times Z$, using

i) max - min composition and

ii) max-product composition. **10**

OR

12. a) Check whether R_1 is equivalence relation or not. Is it fuzzy tolerance relation ? 10

$$\underset{\sim}{R}_1 = \begin{bmatrix} 1 & 0.8 & 0 & 0.1 & 0.2 \\ 0.8 & 1 & 0.4 & 0 & 0.9 \\ 0 & 0.4 & 1 & 0 & 0 \\ 0.1 & 0 & 0 & 1 & 0.5 \\ 0.2 & 0.9 & 0 & 0.5 & 1 \end{bmatrix}$$

b) Explain the following methods of membership value assignment.

i) intuition

ii) inference

iii) rank ordering. 10

Module – II

13. a) The fuzzy sets $\underset{\sim}{A}$, $\underset{\sim}{B}$ and $\underset{\sim}{C}$ are defined on the universe X = [0, 5] with the following membership functions :

$$\mu_{\underset{\sim}{A}}(x) = \frac{1}{1+5(x-5)^2}, \mu_{\underset{\sim}{B}}(x) = 2^{-x}, \ \mu_{\underset{\sim}{C}}(x) = \frac{2x}{x+5}$$

i) Sketch the membership functions.

ii) Define λ - cut sets for each of the fuzzy sets $\underset{\sim}{A}$, $\underset{\sim}{B}$ and $\underset{\sim}{C}$ for the following values of λ :

a) $\lambda = 0.2$

b) $\lambda = 0.7$

c) $\lambda = +0$

d) $\lambda = 1.0$. 12

b) Show that any λ - cut relation (for $\lambda > 0$) of a fuzzy equivalence relation results in a crisp equivalence relation. 8

OR

14. a) Explain various defuzzification methods, with suitable examples. 14

b) Briefly explain fuzzy rule based system. 6

Module – III

15. a) Explain the design steps of a general fuzzy controller, with a neat diagram. 15

b) Write a note on fuzzy image processing. 5

OR

16. a) Explain fuzzy c–means clustering method. 10

b) Explain how a fuzzy system can be approximated by a neural network. 10