



LOYOLA COLLEGE (AUTONOMOUS) CHENNAI – 600 034

M.Sc. DEGREE EXAMINATION – MATHEMATICS

SECOND SEMESTER – APRIL 2025



PMT2ME01 – FUZZY LOGIC AND NEURAL NETWORKS

Date: 07-05-2025

Dept. No.

Max. : 100 Marks

Time: 01:00 PM - 04:00 PM

SECTION A – K1 (CO1)

Answer ALL the questions

(5 x 1 = 5)

1 Answer the following

- Differentiate between fuzzy set and crisp set.
- Write the condition for difference of two $\chi_A(x)$ and $\chi_B(x)$
- State the formula of centroid method for value assignment.
- Give an example for λ -cuts fuzzy relations.
- What are fuzzy models?

SECTION A – K2 (CO1)

Answer ALL the questions

(5 x 1 = 5)

2 Choose the correct answer

- Fuzzy set is a collection of _____ objects.
i) Well defined ii) not defined iii) not well-defined iv) any
- If the composition operation T of any two fuzzy sets R and S , is given $T = R \circ S$ then the product is,
i) $(\chi_R(x, y) \circ \chi_S(y, z))$ ii) $(\chi_S(x, y) \circ \chi_R(y, z))$
iii) $(\chi_R(x, y) \circ \chi_S(x, z))$ iv) $(\chi_S(x, y) \circ \chi_R(x, z))$
- For a fuzzy set $A = \left\{ \frac{1}{a} + \frac{0.9}{b} + \frac{0.6}{c} + \frac{0.01}{d} + \frac{0}{e} \right\}$ for a λ cut of 0.6, then $A_{0.5}$ is given by,
i) $\left\{ \frac{1}{a} + \frac{1}{b} + \frac{0}{c} + \frac{0}{d} + \frac{1}{e} \right\}$ ii) $\left\{ \frac{1}{a} + \frac{0}{b} + \frac{0}{c} + \frac{0}{d} + \frac{1}{e} \right\}$
iii) $\left\{ \frac{1}{a} + \frac{1}{b} + \frac{1}{c} + \frac{0}{d} + \frac{0}{e} \right\}$ iv) $\left\{ \frac{1}{a} + \frac{1}{b} + \frac{1}{c} + \frac{0}{d} + \frac{1}{e} \right\}$
- Fuzzy Tolerance Relation exhibits the properties of
i) reflexive and transitive ii) reflexive and symmetric
iii) symmetric and transitive iv) All the three
- The neural network works with _____ propagation
i) Forward ii) Backward iii) Forward and Backward iv) any of the options

SECTION B – K3 (CO2)

Answer any THREE of the following

(3 x 10 = 30)

3 Briefly explain the application of Fuzzy.

4	Create an illustration for explaining defuzzification process.
5	Where are neural networks being used?
6	Draw and explain Mc Culloch- Pitts net for XOR and AND NOT truth table.
7	Create an illustration for explaining Fuzzification process.

SECTION C – K4 (CO3)

	Answer any TWO of the following (2 x 12.5 = 25)
8	State the applications of Hetero associative memory neural network.
9	How are Natural languages considered in Fuzzy logic? Illustrate with an example.
10	Explain the modeling perception of Hot and Cold with a McCulloch-Pitts Net.
11	Explain Adaptive Resonance Theory II.

SECTION D – K5 (CO4)

	Answer any ONE of the following (1 x 15 = 15)																
12	Briefly explain the concept of Fuzzy logic.																
13	Three separate regions along the San Andreas fault in California have suffered damage from a recent earthquake. For purposes of assessing pay outs from insurance companies to building owners, the five regions must be classified as to their damage levels. Expression of the damage in terms of relations will prove helpful. Surveys are conducted of the buildings in each region. All the buildings in each region are described as being in one of three damage states: no damage, medium damage, and serious damage. Each region has each of these three damage states expressed as a percentage (ratio) of the total number of buildings. Hence, for this problem $n = 3$ and $m = 3$. The following table summarizes the findings of the survey team: <table><tr><td>Region</td><td>x_1</td><td>x_2</td><td>x_3</td></tr><tr><td>x_{i1} – Ratio with no damage</td><td>0.3</td><td>0.2</td><td>0.1</td></tr><tr><td>x_{i2} – Ratio with medium damage</td><td>0.6</td><td>0.4</td><td>0.6</td></tr><tr><td>x_{i3} – Ratio with serious damage</td><td>0.1</td><td>0.4</td><td>0.3</td></tr></table> Use the cosine amplitude method to express these data as a fuzzy relation.	Region	x_1	x_2	x_3	x_{i1} – Ratio with no damage	0.3	0.2	0.1	x_{i2} – Ratio with medium damage	0.6	0.4	0.6	x_{i3} – Ratio with serious damage	0.1	0.4	0.3
Region	x_1	x_2	x_3														
x_{i1} – Ratio with no damage	0.3	0.2	0.1														
x_{i2} – Ratio with medium damage	0.6	0.4	0.6														
x_{i3} – Ratio with serious damage	0.1	0.4	0.3														

SECTION E – K6 (CO5)

	Answer any ONE of the following (1 x 20 = 20)
14	Design a social problem and apply any fuzzy model to illustrate it.
15	Create a simple perceptron for pattern classification.

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