Roll No.							

24-MA-43

M.Sc. IV SEMESTER [MAIN/ATKT] EXAMINATION
JUNE - JULY 2024

MATHEMATICS
Paper - III
[Advanced Fuzzy Mathematics-II]

[Max. Marks : 75] *[Time : 3:00 Hrs.]* *[Min. Marks : 26]*

Note : Candidate should write his/her Roll Number at the prescribed space on the question paper.
Student should not write anything on question paper.
Attempt five questions. Each question carries an internal choice.
Each question carries **15 marks.**

Q. 1 Define fuzzy relation. Find projections and cylindrical extensions of - **(15 Marks)**

$$R = \begin{pmatrix} .8 & 1 & .1 & .7 \\ 0 & .8 & 0 & 0 \\ .9 & 1 & .7 & .8 \end{pmatrix}$$

OR

Compare the following two fuzzy relation $\tilde{R}_1$ and $\tilde{R}_2$ by using **(15 Marks)**

i) Max - Min composition.

ii) Max-Prod composition.

iii) Max-Av. composition.

where,

$$\tilde{R}_1 = \begin{array}{c} \\ x_1 \\ x_2 \end{array} \begin{array}{c} \begin{array}{cccc} y_1 & y_2 & y_3 & y_4 \end{array} \\ \begin{pmatrix} .3 & 0 & .7 & .3 \\ 0 & 1 & .2 & 0 \end{pmatrix} \end{array}$$

$$\tilde{R}_2 = \begin{array}{c} \\ y_1 \\ y_2 \\ y_3 \\ y_4 \end{array} \begin{array}{c} \begin{array}{ccc} z_1 & z_2 & z_3 \end{array} \\ \begin{pmatrix} 1 & 0 & 1 \\ 0 & .5 & .4 \\ .7 & .9 & .6 \\ 0 & 0 & 0 \end{pmatrix} \end{array}$$

Q. 2 Explain Evidence Theory and write properties of belief measure. **(15 Marks)**

OR

P.T.O.

a) Define ncc and POS. Also write important results and their properties. **(05 Marks)**

b) Two quality control experts from print laser Inc. are trying to determine the source of scratches on the media that exists the sheet feeder of a new laser printer already in production one possible source is the upper arm and the other source is media sliding on top of other media we shall denote the following focal elements. **(10 Marks)**

W denotes scratches from upper arm, N denotes scratches from other media. The expert provide their assessments of evidence supporting each of the focal elements as follows -

Focal Element	Expert 1, m_1	Expert 2, m_2
W	.6	.3
M	.4	.7
$W \cup M$	0	0

Determine the belief, plausibility and probabilities for each non - null focal element.

Q. 3 a) Write 5 connectives of crisp logic with their English words, symbol and order. **(05 Marks)**

b) Define Disjunctive and Conjunctive normal form. Obtain disjunctive normal form of - **(10 Marks)**

i) $(p \wedge \neg(q \wedge r)) \vee (p \rightarrow q)$

ii) $p \vee (\neg p \rightarrow (q \vee (q \rightarrow \neg r)))$

OR

Let X = {a, b, c, d} , Y = {1, 2, 3, 4} **(15 Marks)**

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

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

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

Determine the implication relations

i) If *x* is $\widetilde{A}$ Then y is $\widetilde{B}$

ii) If *x* is $\widetilde{A}$, Then y is $\widetilde{B}$ else y is $\widetilde{C}$.

Q. 4 Explain Fuzzification and defuzzification. Also write formula for defuzzification methods - **(15 Marks)**

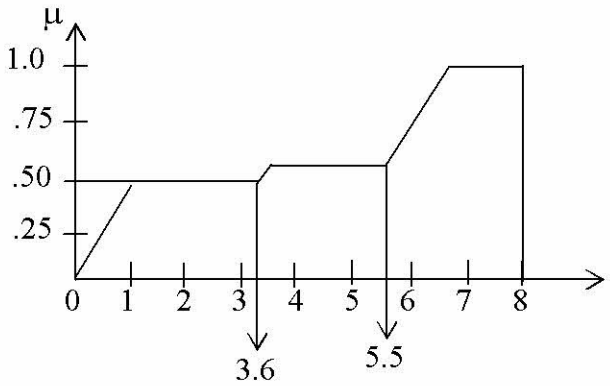
i) Centre of Area. ii) Centre of Sum

ii) Mean of Maxima iv) Centre of Maxima

OR

Cont. . . .

Let Aggregate of fuzzy set of three fuzzy set $\tilde{A}_1$, $\tilde{A}_2$ and $\tilde{A}_3$ are as shown in following figure - (15 Marks)



Defuzzify $\tilde{A}_1$, $\tilde{A}_2$, $\tilde{A}_3$ using

a) Centroid method

b) Weighted average method and

$$x^* = \frac{\int \mu_c(x) \cdot x \, dx}{\int \mu_c(x) \, dx}$$

Q. 5 What is Fuzzy Control ? Write steps in designing a simple fuzzy logic control ? (15 Marks)

OR

Explain Greg's Viot's Fuzzy Cruise Controller to calculate degree of membership. (15 Marks)

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