Vishal Pandey
2020490363
CSD

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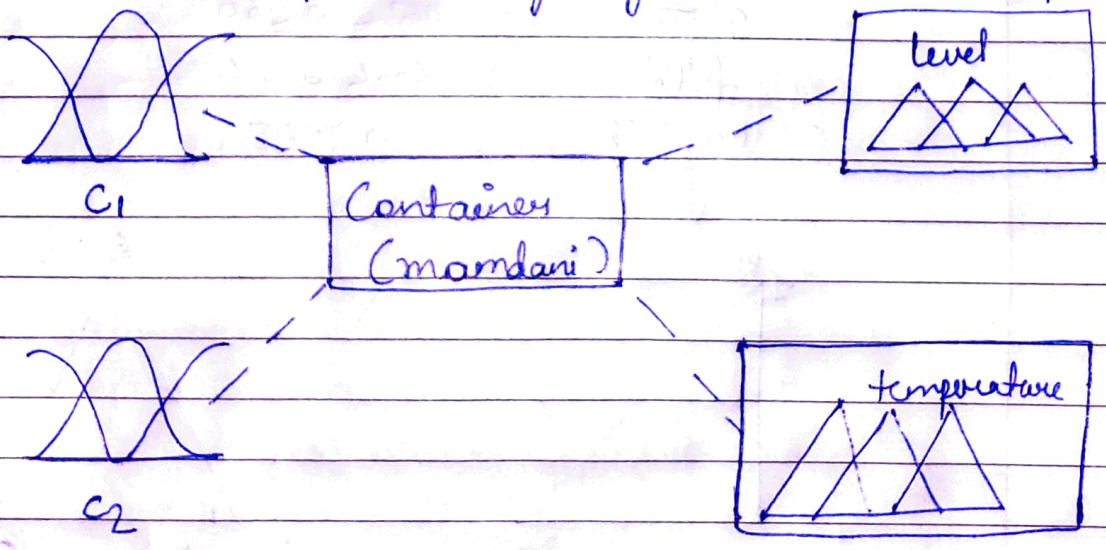
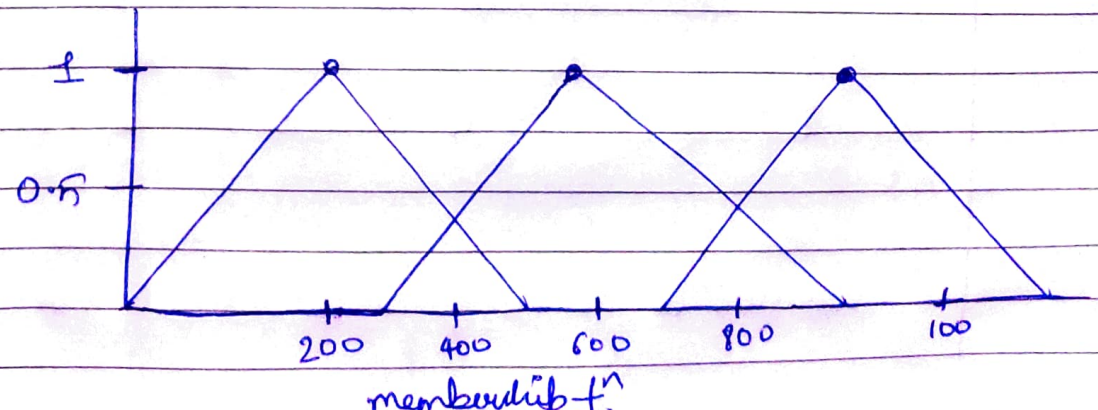
Soft Computing
Assignment: 2

Ques1: Consist of two outputs i.e. temperature and level and input is C1 and C2.
It consist of 4 basic steps:

1. Fuzzy Matching: Calculate degree to which the input data match the conditions.
2. Inference: Cal. the rules conclusion based on its matching degree.
3. Combination: Combine the conclusion inferred by all fuzzy rules into a final conclusion.
4. Defuzzification: for applications that need a crisp output. fuzzy conclusion → crisp.





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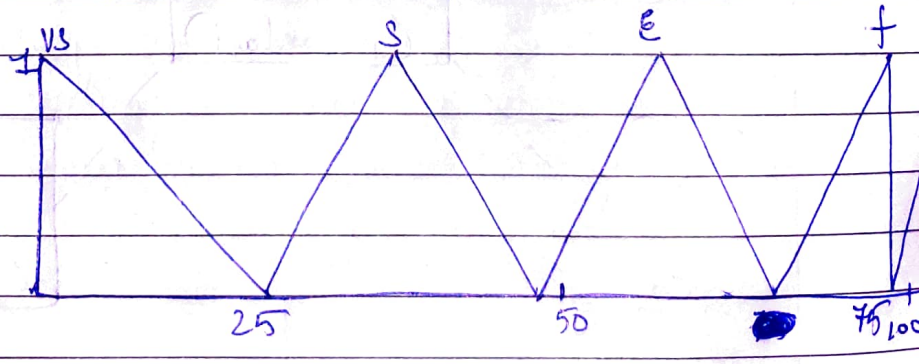
Input		Output	
C_1		level	
① small	[0, 300, 500]	① low	[10, 30, 50]
② med	[300, 500, 700]	② med	[30, 50, 70]
③ large	[300, 700, 1000]	③ high	[50, 75, 100]
C_2		Temp	
① small	[0, 300, 500]	① cold	[15, 25, 35]
② med	[300, 500, 700]	② warm	[30, 50, 70]
③ large	[500, 700, 1000]	③ hot	[50, 75, 100]

Ques:
very small : $W \leq 25$
small : $25 < W < 45$
empty : $45 < W \leq 60$
full : $60 < W \leq 75$
very full : $W > 75$



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Ques 4:

If A & B are two fuzzy sets, defined with the same universe of discourse.

① $(A \cup B)_\lambda = A_\lambda \cup B_\lambda$

② $(A \cap B)_\lambda = A_\lambda \cap B_\lambda$

③ $(\bar{A})_\lambda \neq \bar{A}_\lambda$ except for values of $\lambda = 0.5$

④ for any $\lambda \leq \alpha$, where α varies between 0 & 1 it is true that $A_\alpha \subseteq A_\lambda$, where the value of A_0 will be the universe of discourse.

If R & S are two fuzzy relations, defined with two same fuzzy sets over the same universe.

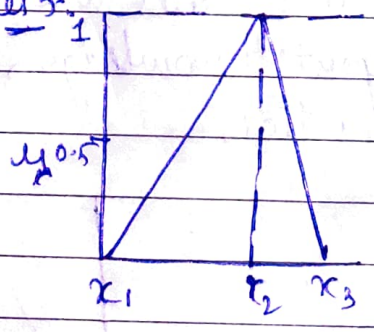
$(R \cup S)_\lambda = R_\lambda \cup S_\lambda$

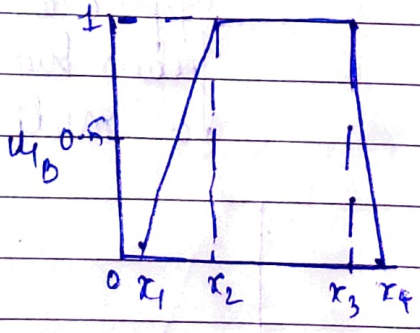
$(R \cap S)_\lambda = R_\lambda \cap S_\lambda$

$(\bar{R})_\lambda \neq \bar{R}_\lambda$

for $\lambda \leq \alpha$, where α lies between 0 & 1 then, $R_\alpha \subseteq R_\lambda$

Ques 5.





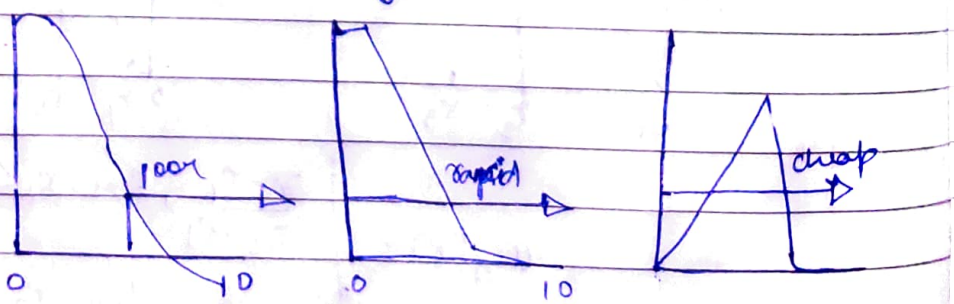
$$\mu_A(x) = \begin{cases} \frac{x - x_1}{x_2 - x_1}, & \text{for } x_1 \leq x \leq x_3 \\ \frac{x - x_3}{x_2 - x_3}, & \text{for } x_2 \leq x \leq x_3 \\ 0, & \text{otherwise} \end{cases}$$

with $x_1 < x_2 < x_3$ &

$$\mu_A(x) = \begin{cases} \frac{x - x_1}{x_2 - x_1}, & \text{for } x_1 \le x \le x_2 \\ 1, & \text{for } x_2 \le x \le x_3 \\ \frac{x - x_4}{x_3 - x_4}, & \text{for } x_3 \le x \le x_4 \\ 0, & \text{otherwise} \end{cases}$$

Ques: • Mamdani fuzzy inference was first introduce as a method to create a control system by synthesizing set of linguistic control rules obtained from experienced human operators. In Mamdani system, the output of each rule is a fuzzy set.

• Since Mamdani systems have more intuitive and easier to understand rule bases, they are well suited to expert system application where the rules are created from human expert knowledge, such as medical diagnostics.



service is poor or food is rancid then tip = drop