Max Time- 30 min   Max Marks - 25   Date: 15.12.2020


Q1. The inputs x1 and x2 and output u of a fuzzy model are described by the membership functions as shown below where N, Z, P imply Negative, Zero and Positive and L, M, H imply Low, Medium and High respectively. Compute the output u for the input pair x1=0.8 and x2=-3.2 considering the given rule base and the following:

    i)   minimum t-norm and maximum t-conorm operators
    ii)   Mamdani inference with the interpretation of the rule 'If A Then B' as 'A entails B' given by $A \rightarrow B = \bar{A} + B$
    iii)   centre of sums defuzzification method   [15]
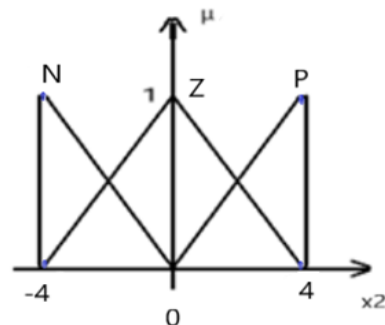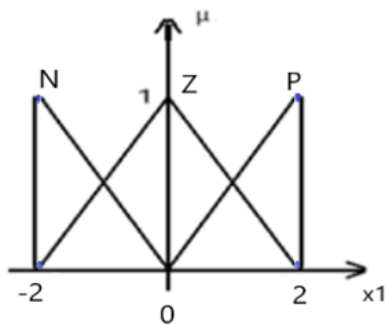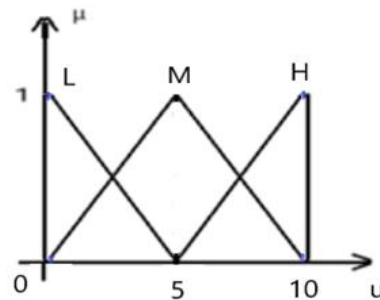
Q2. Consider the following 4 data points in a 2-D feature space where each dimension is confined in the range [0, 5]. The data points are to be grouped in two hard clusters using a GA based K-means algorithm. Suppose data points 2 and 3 are randomly chosen as cluster centers to represent a member of the GA population. Write down the corresponding binary string and also compute the fitness of the member. Assume resolution level along each dimension to be 0.2. Need not normalize the dataset.   [10]

S. No.	Data point
1.	$\begin{bmatrix} 2 \\ 3.5 \end{bmatrix}$
2.	$\begin{bmatrix} 2.5 \\ 4 \end{bmatrix}$
3.	$\begin{bmatrix} 1.2 \\ 1 \end{bmatrix}$
4.	$\begin{bmatrix} 5 \\ 0 \end{bmatrix}$

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