

**BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(END SEMESTER EXAMINATION)**

CLASS: BE
BRANCH: CSE

SEMESTER : VII
SESSION : MO/19

SUBJECT: CS5105 SOFT COMPUTING

TIME: 3:00 HOURS

FULL MARKS: 60

INSTRUCTIONS:

1. The question paper contains 7 questions each of 12 marks and total 84 marks.
2. Candidates may attempt any 5 questions maximum of 60 marks.
3. The missing data, if any, may be assumed suitably.
4. Before attempting the question paper, be sure that you have got the correct question paper.
5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.

- Q.1(a) What is membership function? Explain. [2]
- Q.1(b) What are alpha cut and its variation? Highlight the role of these in fuzzy logic. [4]
- Q.1(c) Let A and B be two fuzzy sets defined as [6]
 $A = 1/x_1 + .7/x_2 + .9/x_3 + .8/x_4 + .9/x_5$, and
 $B = .9/x_1 + .9/x_2 + .2/x_3 + .1/x_4 + 1/x_5$
 Find (a) $B-A$ (b) $A \cup B$ (c) $\neg(A \cap B)$ (d) $S(A,B)$ (e) $d(A,B)$ (f) $A-B$
- Q.2(a) What is extension principle for fuzzy sets? Explain with the help of example. [5]
- Q.2(b) Let A and B be two fuzzy numbers defined as [7]

$$A(x) = \begin{cases} 0 & \text{for } x \leq -1 \text{ and } x > 3 \\ (x + 1) / 2 & \text{for } -1 < x \leq 1 \\ (3 - x) / 2 & \text{for } 1 < x \leq 3 \end{cases}$$

$$B(x) = \begin{cases} 0 & \text{for } x \leq 1 \text{ and } x > 5 \\ (x - 1) / 2 & \text{for } 1 < x \leq 3 \\ (5 - x) / 2 & \text{for } 3 < x \leq 5 \end{cases}$$
 Find (a) $(A \cdot B)(x)$ [multiply] (b) $(A/B)(x)$
- Q.3(a) What is defuzzification? Why it is needed? [5]
- Q.3(b) Differentiate between Centroid method and Centre of Sums method of defuzzification with example. [7]
- Q.4 Let the initial population be 0 1 1 0 0 , 1 1 0 0 1 , 0 0 1 0 1 , 1 0 0 1 1. Maximize the function $f(x) = x^2$ [12]
 Where x is permitted to vary between 0 and 31.
- Q.5(a) Compare and contrast biological neuron and artificial neuron. [2]
- Q.5(b) In what ways bipolar representation better than binary representation. Elaborate with example. [4]
- Q.5(c) Implement AND function using McCulloch-Pitts neuron by taking binary data. [6]
- Q.6(a) What is meant by unsupervised learning? Explain. [2]
- Q.6(b) How is a Madaline network formed? Elaborate with example. [4]
- Q.6(c) Calculate the output of neuron Y for the net shown below. Use binary and bipolar sigmoidal activation functions. [6]
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 graph LR
 I1((1)) -- 0.9 --> Y((Y))
 X1((X1)) -- 0.2 --> Y
 X2((X2)) -- 0.3 --> Y
 In1[0.7] -- X1 --> X1
 In2[0.8] -- X2 --> X2
 Y --> Out[y]

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- Q.7(a) Define with example the Euclidean distance. [2]
- Q.7(b) Draw and explain the model of Adaline network. [4]
- Q.7(c) Implement ANDNOT function using McCulloch-Pitts neuron using binary data representation. [6]