School of Information Technology
IIT Kharagpur

Course Id: IT60108 Soft Computing Applications   **Class Test 1**

Date: January 28, 2009   **Total Time: 1 Hour**

Max. Marks: 40

Instructions: Answer all questions. You may answer the questions in any order. However, all parts of the same question must be answered together. Clearly state any reasonable assumption you make.

1.
   (a) Show that Yager's class of fuzzy complements satisfies the involution property.
   (b) Prove that for this class of complements, the requirement: $\mu_A(x_1) - \mu_A(x_2) = \mu_{Abar}(x_2) - \mu_{Abar}(x_1)$ is satisfied for all x_1 and x_2 iff the parameter $w = 1$.
   (c) Prove or Disprove that Bounded Product and Bounded Sum as T-norm and T-conorm operators are dual of each other in the sense of the generalized DeMorgan's Law with Yager's class of complements as the complementation functions.   **[5+5+5=15]**

2. If a fuzzy set A has membership function: Trapezoid(x; 1, 5, 18, 20) and another fuzzy set B has membership function: Trapezoid(x; 2, 6, 12, 20), plot the value of A$\cup$B between x=5 and x = 15 using bounded sum as the S-norm operator.   **[5]**

3.
   (a) Define a Contrast Diminisher operator (DIM) such that DIM(INT(A)) = A, where INT is the contrast intensification operator.
   (b) Define the membership functions of an orthogonal term set {young, middle-aged, old} of the linguistic variable age on the universe of discourse X = [0, 80]. The fuzzy sets should be normal and membership functions should be non trivial and meaningful.
   (c) Using the operator in (a) above, what is the value of DIM(old) for age = 70 considering your definition of membership functions?   **[5+8+2=15]**

4. Consider the fuzzy set **Young** defined by the membership function sig(age; -4, 12).
   (a) Define meaningful membership functions of two fuzzy sets **Too Young** and **More or Less Young** based on the membership function of **Young**.
   (b) What is the degree of membership value of a student of age 15 in the fuzzy set **More or Less Young but not Too Young**?   **[2+3=5]**