EE4305 Introduction to Fuzzy/Neural Systems

Problem-Solving 1

1. For a universal set $X = \{a, b, c, d, u, v, w, x, y, z\}$, a fuzzy set A is defined as:

$$A = 0.2/v + 0.4/w + 0.6/x + 0.8/y + 1/z$$

Show that the fuzzy set A can be represented by $A = \bigcup_{\alpha \in [0,1]} \alpha \cdot A_\alpha$, where αA_α denotes the algebraic product of a scalar α with the α-cut A_α

2. Let A, B be fuzzy sets defined on a universal set X. Prove that

$$|A| + |B| = |A \cup B| + |A \cap B|$$

where $\cap$, $\cup$ are the standard fuzzy intersection and union, respectively.

3. Show that the function

$$c(a) = \frac{\alpha^2(1-a)}{a + \alpha^2(1-a)}, \quad \forall\, a \in [0, 1],\ \alpha > 0$$

is a fuzzy complement, and find the equilibrium of the fuzzy complement c.