Tut 3

1. Let X = [0, 100] be the universe of discourse. Let the linguistic variable *speed* have two values: **fast** and **slow**, whose membership functions are defined as follows:

$$\mu_{fast}(x) = \begin{cases} 0 & if\ 0 \le x < 40 \\ 0.025(x-40) & 40 \le x < 80 \\ 1.0 & 80 \le x \le 100 \end{cases}$$

and

$$\mu_{slow}(x) = \begin{cases} 1.0 & if\ 0 \le x < 40 \\ -0.025(x-80) & 40 \le x < 80 \\ 0 & 80 \le x \le 100 \end{cases}$$

Determine the following linguistic values:

(a) A = "very fast"
(b) B = "not fast and not slow"
(c) C = "not fast or very slow"
(d) D = "more or less slow"

2. Given three universes X = Y = Z = {0, 1, 2, 3, 4}, let A⊆X, B⊆Y and C⊆Z be three fuzzy sets, which are defined as follows:

A = 0/0 + 0.2/1 + 0.4/2 + 0.8/3 + 0.5/4
B = 1.0/0 + 0.8/1 + 0.6/2 + 0.4/3 + 0.2/4
C = 0.5/0 + 0.6/1 + 0.9/2 +0.5/3 + 0.1/4

Perform the following calculations:

(a) Use fuzzy matrices to describe the if-then rules of R1:=A→C and R2:=B→C.
(b) Use fuzzy matrix to describe the if-then rule of R3:=A×B→C. What's the relationship between R3 and R1, R2?
(c) Let A' = 0.2/0 + 0.4/1 + 0.2/2 + 0.8/3 + 0/4 and B'=0.7/0 + 0.2/1 + 0.4/2 + 0.9/3 + 1.0/4. Determine two degrees of compatibility and the firing strength. Calculate the fuzzy inference conclusion.

3. Discuss whether the weak distribution over intersection R°(S∩T) ⊆ (R°S) ∩ (R°T) with max-product composition, and algebraic product for intersection holds.