

LUT/LBS
A240A0060 Fuzzy Sets and Fuzzy Logic
Exam 23.3.2026 / PL

- Let $A(x) = \Lambda(x, 3, 4, 7)$ and $B(x) = \Lambda(x, 1, 5, 6)$. Calculate following:
a) ${}^\alpha(A \cap B)$, b) ${}^\alpha(A \cup B)$ when $\alpha = 0.3$.
- Find the equilibrium point for following fuzzy complement $c_\lambda(a) = \sqrt[\lambda]{1 - a^\lambda}$. Calculate the equilibrium point when $\lambda = 3$.
- For fuzzy numbers $A = (1, 3, 6)$, $B = (2, 3, 5)$, $C = (-4, -2, -1)$ calculate a) $A - B$ b) $\frac{B}{A}$ c) $A \cdot C$.
- Let sets of values of variables \mathcal{X} and \mathcal{Y} be $X = \{x_1, x_2, x_3\}$ and $Y = \{y_1, y_2\}$, respectively. Assume that a proposition "if \mathcal{X} is A, then \mathcal{Y} is B" is given, where $A = 0.5/x_1 + 0.7/x_2 + 0.9/x_3$ and $B = 0.6/y_1 + 0.8/y_2$. Then, given a fact that expressed by a proposition "x is A'" where $A' = 0.5/x_1 + 0.8/x_2 + 0.9/x_3$, use generalized modus ponens to derive a conclusion in the form " \mathcal{Y} is B'". Use Łukasiewicz implication ($I(x, y) = \min(1, 1 - x + y)$).
- Consider following rules:

R_1 : If funding is adequate and staffing is small then risk is low.

R_2 : If funding is marginal and staffing is large then risk is normal.

Let fuzzy sets be for funding: $adequate(x) = \Pi(x, 60, 80, 100, 100)$,
 $marginal(x) = \Pi(x, 30, 50, 50, 70)$, staffing: $small(y) = \Pi(y, 0, 0, 30, 70)$,
 $large(y) = \Pi(y, 30, 70, 100, 100)$, risk: $low(z) = \Pi(z, 0, 0, 20, 40)$, $normal(z) = \Pi(z, 20, 40, 60, 80)$. For a particular project we get that funding $x_0 = 65$ and staffing $y_0 = 45$. Find out crisp output for risk using Mamdani's inference method.

Calculator is allowed!

You can use Equation collection for fuzzy sets and fuzzy logic course in the exam.