Yaşar University, Faculty of Engineering
Department of Software Engineering
SE 3368 SOFT COMPUTING ASSIGNMENT 2

Explanation: Answer the following questions on a blank A4 sheet with your name, student ID and signature on the first page. You can type or write your answers. Convert your answer sheets to PDF and upload it to the "Assignment 2" link under our class' Moodle page.

QUESTIONS

1. **(20 points)** Let A and B be discrete fuzzy sets defined as follows:

   $$A = \frac{0.3}{1} + \frac{0}{2} + \frac{0.5}{3} + \frac{0.9}{4} + \frac{1}{5} \quad \text{and} \quad B = \frac{0.8}{1} + \frac{1}{2} + \frac{0}{3} + \frac{0.2}{4} + \frac{0.1}{5}$$

   Find $\quad |A|, \ |B|, \ A \cup B, \ A \cap B, \ A - B, \ A^c, \ B^c, \ A \oplus B, \ A \ominus B, \ B_{0.3}$

2. **(40 points)** The continuous fuzzy sets of A, B and C are defined with their membership functions below.

   $$\mu_A(x) = \begin{cases} 0, & x < 0 \\ 2x, & 0 \le x < \frac{1}{2} \\ 1, & \frac{1}{2} \le x < 1 \\ \frac{3-x}{2}, & 1 \le x < 3 \\ 0, & x \ge 3 \end{cases} \quad \mu_B(x) = \begin{cases} 0, & x < \frac{1}{2} \\ \frac{2x-1}{3}, & \frac{1}{2} \le x < 2 \\ 3 - x, & 2 \le x < 3 \\ 0, & x \ge 3 \end{cases} \quad \mu_C(x) = \begin{cases} 0, & x < 1 \\ \frac{x-1}{2}, & 1 \le x < 3 \\ 1, & 3 \le x < 4 \\ -x + 5, & 4 \le x < 5 \\ 0, & x \ge 5 \end{cases}$$

   - Draw the membership functions of A, B and C on the same graph.
   - Draw the membership function graph of $(A \cup C) \cap B$
   - Draw the membership function graph of $(B \cap C) - A$

3. **(40 points)** The following membership functions are about a washing machine's running process.
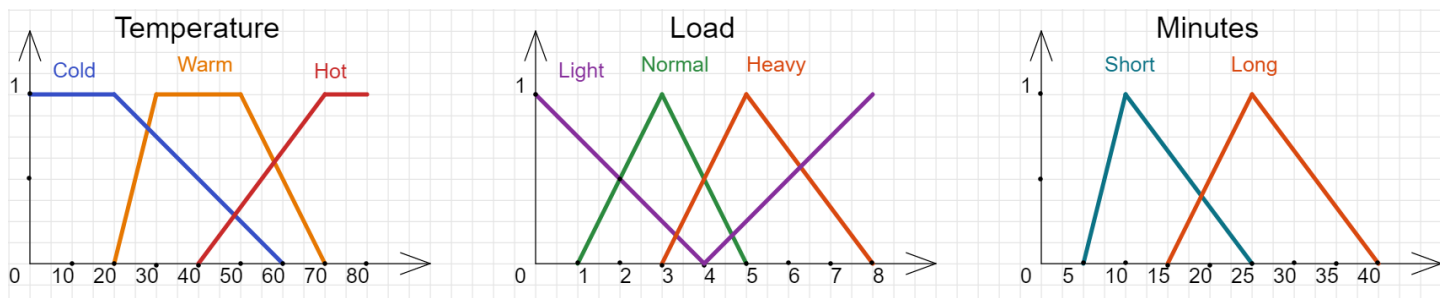
   Rules:

   - R_1 : IF Temperature is Cold AND Load is Normal THEN Minutes is Long.
   - R_2 : IF Temperature is Warm OR Load is Light THEN Minutes is Short.
   - R_3 : IF Load is Heavy THEN Minutes is Long.

   For Temperature = 30 and Load = 4, apply the inference and defuzzification processes. For defuzzification apply CoS(Center of Sums) method. With these given information, how long does the washing machine run?