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# Department of Computer Science & Engineering

## Home Assignment 4

**Programme Name:** MCA. **Semester:** III

**Course Code:** CS33103 **Course Name:** Soft Computing

**Instructions:**

1. *This is a handwritten assignment. You need to scan the written assignment and post the solution. You can keep the hard copy for preparation of examination.*
2. *Last date of submission is 02/11/2020.*

**a.** Suppose A is a fuzzy set defined over a universe of discourse X. If Core(A) denotes the core of the fuzzy set A, then Core(A) is a crisp set. What about the Support(A)?

**b.** For a singleton fuzzy set A, how many crossover point(s) is(are) possible?

**c.** A crisp set A defined over X = {1,2,3,5,7} is A = {1,3,7}. What would be it's equivalent fuzzy set?

**d.** Why Soft computing is preferable than Hard computing to solve some problems? Give examples for each which you should consider for solving:

a. Using Soft computing only.

b. Using Hard computing only.

c. Using both, Soft and Hard computing.

**e.** For the following fuzzy set A defined over a universe of discourse, draw the graph.

X = {10, 15, 20, 25, 30, 35, 40, 45, 50}
A = {(15,0.5), (20,0.4), (25,0.3), (30,0.6), (35,0.8)}

**f** Given two fuzzy sets A and B, defined over the universe of discourses X and Y respectively. Draw the graphs for the following:

(a) $A \times B$

(b) $R: A \rightarrow B$

Given,

A = {(20,0.2), (25,0.4), (30,0.6), (35,0.6), (40,07), (45,0.8), (50,0.8)}

B = {(1,0.8), (2,0.8), (3,0.6), (4,0.4)}

X = {10, 15, 20, 25, 30, 35, 40, 45, 50}

Y = {1, 2, 3, 4}

(c) If x is A then y is B. What rule says if x = 40?

**g.**

Consider three sets as stated below (In the context of courses offered among students)

S = {$s_1$, $s_2$, $s_3$, $s_4$} is a set of students

C = {$c_1$, $c_2$, $c_3$} is a set of courses

P = {$p_1$, $p_2$, $p_3$, $p_4$} denotes a set of level of popularity Two relations are given below:

$R_1$ =

| | $c_1$ | $c_2$ | $c_3$ |
|---|---|---|---|
| $s_1$ | 0.1 | 0.2 | 0.3 |
| $s_2$ | 0.2 | 0.3 | 0.1 |
| $s_3$ | 0.2 | 0.3 | 0.1 |
| $s_4$ | 0.3 | 0.1 | 0.2 |

$R_2$ =

| | $p_1$ | $p_2$ | $p_3$ | $p_4$ |
|---|---|---|---|---|
| $c_1$ | 0.4 | 0.3 | 0.2 | 0.5 |
| $c_2$ | 0.1 | 0.3 | 0.5 | 0.7 |
| $c_3$ | 0.2 | 0.4 | 0.6 | 0.8 |

a. Find $R_1$ o $R_2$.

b. What are the physical implementation of $R_1$, $R_2$ and $R_1$ o $R_2$ ?

**h.**

Decide whether the following fuzzy sets are closed or open?

(a) $\mu_A(x) = \frac{x}{1+x}$

(b) $\mu_A(x) = 2^{-x}$

(c) $\mu_A(x) = \frac{x}{1+x^2}$

(d) $\mu_{A\cap B}$ and $\mu_{A\cup B}$ for $\mu_A$ and $\mu_B$ with the following MFs:

Three fuzzy sets are given as follows:

$$A = \left\{\frac{0.5}{Winter}, \frac{0.33}{Spring}, \frac{0.52}{Summer}, \frac{0.25}{Fall}\right\}$$

$$B = \left\{\frac{0.10}{Winter}, \frac{0.55}{Spring}, \frac{0.90}{Summer}, \frac{0.20}{Fall}\right\}$$

i.

$$C = \left\{\frac{0.22}{High}, \frac{0.55}{Medium}, \frac{0.44}{Low}\right\}$$

Derive the following relations:

(a) If $x$ is $A$ or $y$ is $B$ then $z$ is $C$.

(b) If $x$ is $A$ and $y$ is $\sim B$ then $z$ is $C$.