7.3. Let X= {1, 2, 3}; Y = {a, b}; Z = {w, x, y, z}; and

let	$A = 1.0/1 + 0.4/2 + 0.1/3$
	$B = 0.2/a + 0.8/b$
	$C = 0.0/w + 0.4/x + 0.8/y + 1.0/z$
Consider the rule:	IF U is A THEN W is C

A. Translate this rule using Zadeh's original translation formula (i.e., the Lukasiewicz implication).

B. Show the result of inference if the input is

i. U is A;

ii. U is NOT A;

iii. U is A′ where $A' = 0.6/1 + 1.0/2 + 0.0/3$.

C. Translate the following rule using Correlation-Min encoding:

If U_1 is A and U_2 is B THEN W is C

A.

$$R_Z = \begin{pmatrix} 1 \\ 0.4 \\ 0.1 \end{pmatrix} (0 \quad 0.4 \quad 0.8 \quad 1) = \begin{pmatrix} 0 & 0.4 & 0.8 & 1 \\ 0.6 & 1 & 1 & 1 \\ 0.9 & 1 & 1 & 1 \end{pmatrix}$$

$$R_Z = \min\{1, 1 - A(x) + B(x)\}.$$

B. (1)

$$B = (1 \quad 0.4 \quad 0.1) \begin{pmatrix} 0 & 0.4 & 0.8 & 1 \\ 0.6 & 1 & 1 & 1 \\ 0.9 & 1 & 1 & 1 \end{pmatrix} = (0.4 \quad 0.4 \quad 0.8 \quad 1)$$

$$B = \max\{\min\{A(x), B(x)\}\}$$

$$C' = 0.4/w + 0.4/x + 0.8/y + 1/z$$

(2). $A^c = (0 \quad 0.6 \quad 0.9)$

$$B = (0 \quad 0.6 \quad 0.9) \begin{pmatrix} 0 & 0.4 & 0.8 & 1 \\ 0.6 & 1 & 1 & 1 \\ 0.9 & 1 & 1 & 1 \end{pmatrix} = (0.9 \quad 0.9 \quad 0.9 \quad 0.9).$$

$$C' = 0.9/w + 0.9/x + 0.9/y + 0.9/z$$

(3) $B = (0.6 \quad 1 \quad 0) \begin{array}{c} \begin{array}{cccc} 0 & 0.4 & 0.8 & 1 \end{array} \\ \begin{pmatrix} 0.6 & 1 & 1 & 1 \\ 0.9 & 1 & 1 & 1 \end{pmatrix} \end{array} = (0.6 \quad 1 \quad 1 \quad 1)$

$C' = 0.6/w + 1/x + 1/y + 1/z$

7.5. Let $X_1 = \{1, 2, 3\}$; $X_2 = \{w, x, y, z\}$; $Y = \{a, b\}$; and

let	$A_1 = (0.0, 1.0, 0.6)$	(fuzzy subset of X_1)
	$A_2 = (0.0, 0.4, 0.8, 1.0)$	(fuzzy subset of X_2)
	$B = (0.2, 0.8)$	(fuzzy subset of Y)
Consider the rule:	IF V is A_1 THEN W is B	

A. Translate this rule using Correlation-Product encoding.

B. Show the result of inference (for the translation in part A) if the input is

i. V is A_1

ii. V is NOT A_1

A. $R = A_{(\times)} B_{(\times)}$

$$R = \begin{pmatrix} 0 \\ 1 \\ 0.6 \end{pmatrix} (0.2 \quad 0.8) = \begin{pmatrix} 0 & 0 \\ 0.2 & 0.8 \\ 0.12 & 0.48 \end{pmatrix}$$

B. (1) $B = (0 \quad 1 \quad 0.6) \begin{pmatrix} 0 & 0 \\ 0.2 & 0.8 \\ 0.12 & 0.48 \end{pmatrix} = (0.2 \quad 0.8)$

$B' = 0.2/a + 0.8/b$

(2) $B = (1 \quad 0 \quad 0.4) \begin{pmatrix} 0 & 0 \\ 0.2 & 0.8 \\ 0.12 & 0.48 \end{pmatrix} = (0.048 \quad 0.192)$

$B' = 0.048/a + 0.192/b$