CSCI 5203 | Logic for Computer Science | Fall 2016

Homework # 6 due Friday December 9th

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9.2 Determine all possible truth value using **Lukasiewicz**

a) $p \vee \bar{p}$

p	$\bar{p}$	$p \vee \bar{p}$
0	1	1
½	½	½
1	0	1

b) $p \wedge \bar{p}$

p	$\bar{p}$	$p \wedge \bar{p}$
0	1	0
½	½	½
1	0	0

d) $p \vee (p \wedge q)$

p	q	$p \wedge q$	$p \vee (p \wedge q)$
0	0	0	0
0	½	0	0
0	1	0	0
½	0	0	½
½	½	½	½
½	1	½	1
1	0	0	1
1	½	½	1
1	1	1	1

9.5 – suppose we have a fuzzy proposition

$$Today's\ humidity\ is\ high$$

Using the fuzzy set defined in Fig 9.1a determine the truth value of the proposition for today's humidity 50, 60, 70, 80, 90, and 100 respectively

$$T(p_{50}) = H(50) = 0$$

$$T(p_{60}) = H(60) = 0$$

$$T(p_{70}) = H(70) = 0.3$$

$$T(p_{80}) = H(80) = 1$$

$$T(p_{90}) = H(90) = 1$$

$$T(p_{100}) = H(100) = 1$$

9.6 - suppose a 500-page book costs \$60. Using the fuzzy sets in Fig 9.3, calculate the truth value of the propositions

a) "if the textbook is large, then it is expensive" (is true)

— $L(500) = 1,\ E(60) = 1$

$$T(p_{x,\ y}) = \min(1, 1 - L(x) + E(y))$$

$$T(p_{500,\ 60}) = \min(1, 1 - 1 + 1) = 1$$

$$\therefore T(p_{500,\ 60}) = 1$$

b) "if textbox is not large, then it is not expensive" (is true)

$L(500)_{large} = 1\,,\qquad E(60)_{expensive} = 1$

$L(500)_{not\ large} = 1 - L(500)_{large}$

$E(60)_{not\ expensive} = 1 - E(60)_{expensive}$

$$L(500)_{not\ large} = 1 - 1 = 0$$

$$E(60)_{not\ expensive} = 1 - 1 = 0$$

$$T(p_{x,\ y}) = \min(1, 1 - L(x) + E(y))$$

$$T(p_{500,\ 60}) = \min(1, 1 - 0 + 0) = 1$$

c) The propositions (a) and (b) with qualifier $very\ true$, where $very(a) = a^2$ for any $a \in [0,1]$

- a) "if the textbook is large, then it is expensive" (is very true)

  $L(500)_{true} = 1,\ E(60)_{true} = 1$

  $L(500)_{very\ true} = 1^2 = 1$

  $E(60)_{very\ true} = 1^2 = 1$

  $T(p_{x,\ y}) = \min(1, 1 - L(x) + E(y))$

  $T(p_{500,\ 60}) = \min(1, 1 - 1 + 1) = 1$

- b) "if textbox is not large, then it is not expensive" (is very true)

  $L(500)_{true} = 0$

  $E(60)_{true} = 0$

  $L(500)_{very\ true} = 0^2 = 0$

  $E(60)_{very\ true} = 0^2 = 0$

$$T(p_{x,\ y}) = \min(1, 1 - L(x) + E(y))$$

$$T(p_{500,\ 60}) = \min(1, 1 - 0 + 0) = 1$$