

EE 2720, Fall 2011  
Homework #3

Due Monday October 17, 2011, in class.

NOTE: for problem #3 use the theorem that states

$$(X+Y) \cdot Z = (X+Y) \cdot (X+Z)$$

Enjoy your homework!  
Alex

EE 2720, Homework # 3

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NOTE: Please STAPLE your homework.

Problem 1: Prove theorem  $(T11')$  of handout #5. You are not allowed to use the Principle of Duality. In other words don't tell me that because  $(T11)$  is true so is  $(T11')$ . You are also not allowed to use a truth table. Hint: Use the theorem that states  $(X + Y) \cdot (X' + Z) = X \cdot Z + X' \cdot Y$

Problem 2: Write the canonical sum and canonical product for each of the following logic functions:

(a)  $F = \sum_{x,y} (1, 2)$

(b)  $F = \prod_{A,B} (0, 1, 2)$

(c)  $F = \sum_{A,B,C} (3, 4, 6, 7)$

(d)  $F = \prod_{M,N,P} (0, 1, 3, 6, 7)$

(e)  $F = X + Y' \cdot Z'$

(f)  $F = A' \cdot B + B' \cdot C + A$

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Problem 3: Write the canonical product for the following logic function:

$$F = (a+b) \cdot (a+c) \cdot (b+c)$$

You are not allowed to provide the canonical sum first and then convert it into canonical product.

Hint: ~~X~~  $X \cdot X' = 0$  and  $X + 0 = X$ . Now the problem is not that difficult.

Problem 4: Consider the logic function F where F is  $F = A \cdot B' + C' \cdot D + E'$ .

Realize F using only NAND gates. Use both the algebraic as well as the graphical approach. You must show figures of course.

Problem 5: Consider the logic function F where F is  $F = (A+B') \cdot (C'+D) \cdot E'$ .

Realize F using only NOR gates. Use both the algebraic as well as the graphical approach. You must show figures of course.

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Problem 6: Prove equations (5), (6), (7), (8) and (11) on page 8 of handout # 11; (they relate to the XOR operator). You are not allowed to use a truth table when proving equation (11).