

EE 2720, Spring 2012

Homework #3

Due Wednesday March 14, 2012, in class

EE 2720, Homework # 3

(1)

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

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 1: $X \cdot X' = 0$ and $X + 0 = X$

Hint 2: $X + Y \cdot Z = (X + Y) \cdot (X + Z)$

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).