

COE 200 – 042 HW # 3.

Problem 1. Prove the following Identities using Boolean algebraic manipulation:

- a) $x'y' + xy + x'y = x' + y$
- b) $(x + y)(x + y') = x$
- c) $x'y + xy' + xy + x'y' = 1$
- d) $x' + xy + xz' + xy'z' = y + x' + z'$
- e) $xy' + y'z' + x'z' = xy' + x'z'$

Problem 2. Simplify the following expressions to a minimum number of “*literals*” using Boolean algebraic manipulation

- a) $ABC + A'B + ABC'$
- b) $x'yz + xz = z.(y + x)$
- c) $(x + y)'(x' + y') = x'y'.(x' + y') = x'y'$
- d) $xy + x(wz + wz') = x(y + w)$
- e) $(BC' + A'D)(AB' + CD') = 0 + 0 + 0 + 0 = 0$

Problem 3. Reduce the following Boolean Expressions to the indicated number of “*literals*” using Boolean algebraic manipulation

- a. $A'C' + ABC + AC' \rightarrow (3 \text{ literals})$
- b. $((CD)' + A)' + A + CD + AB \rightarrow (3 \text{ literals})$
- c. $A'B(D' + C'D) + B(A + A'CD) \rightarrow (1 \text{ literal})$
- d. $(A' + C)(A' + C')(A + B + C'D) \rightarrow (4 \text{ literals})$
- e. $= A'(A + B + C'D) \rightarrow (4 \text{ literals})$

Problem 4. Using De-Morgan's theorem to derive the complement (F') of the function

$$F = x + yz$$

Using algebraic manipulations verify (for this function) that $F.F' = 0$ as well as $(F + F' = 1)$

Problem 5. Derive the truth table and draw the logic diagram of the following functions:

- a) $BC' + AB + ACD$
- b) $(A + B)(C + D)(A' + B + D)$
- c) $(AB + A'B')(CD' + C'D)$