

Homework Assignment #2

Reading Assignment:

Chapter 2 in the textbook Logic and Computer Design Fundamentals, 4th Edition by Mano

Problem Assignment:

- 1) Chapter 2 problems: 1a, 6, 7, 9, 10, 13, 14, 15, 17, 19, 22, 23, 29*, 30*, 31
 * For problems 2-29 and 2-30 also draw the circuits and determine the *gate input cost* (including input inverters).
- 2) Determine minimal SOP expressions for each part below using 5-variable Karnaugh maps
 - a. $F(A,B,C,D,E) = \Sigma m(0,1,4,5,16,17,21,25,29)$
 - b. $F(A,B,C,D,E) = A'B'CE' + A'B'C'D' + B'D'E' + B'CD' + CDE' + BDE'$
- 3) Minimize each of the following expressions using K-Maps (make use of XOR gates if they reduce the number of gates):
 - a) $f(A,B,C) = \Sigma (1,3,4,6)$
 - b) $f(A,B,C) = \Sigma(0,6)$
 - c) $f(A,B,C,D) = \Sigma(0,2,5,7,8,10,13,15)$
 - d) $f(A,B,C,D) = \Sigma(1,4,11,14)$
 - e) $f(A,B,C,D) = \Sigma (0,3,5,6,9,10,12,15)$

Problem Format and Solutions: (See notes on Homework #1)

Selected Answers:

- 2.6) a) $A' + B'C$ b) $A'B'C'$ c) $A(B + C)$ d) $(A' + B)D$ e) 0
- 2.14) a) $X'Z' + XY$ b) $X'Y' + X'Z' + Y'Z'$ c) $C' + A'B$ d) $B'C' + A'B + AC$ (or else $BC + AB' + A'C'$)
- 2.23) a) SOP: $A'B'C' + A'BD + ABC + AB'D'$ or SOP: $A'C'D + BCD + ACD' + B'C'D'$
 POS: $(A+B+C')(A+B'+D)(A'+B'+C)(A'+B+D')$ or
 POS: $(A+C'+D)(B'+C+D)(A'+C+D')(B+C'+D')$
- b) SOP: $Z' + W'X + X'Y'$
 POS: $(W'+X'+Z')(X+Y'+Z')$
- 2.29) a) $F = (X_1 + X_2)X_3$ where $X_1 = AB'$, $X_2 = A'B$, $X_3 = C+D$, gate input cost = 12
 b) $F = X_1Y + X_1(W' + X')Z$ where $X_1 = W+X$, gate input cost = 13
- 2.30) $F = X_1 + A'C'X_2$ and $G = X_1 + A'CX_2$ where $X_1 = AC$, $X_2 = BD + B'D'$
 Gate input cost = 22
- 2.31) a) $F = ABC'D' + ABCD + B'CD' + B'C'D + A'B'C' + A'B'D'$
 b) $T = WYZ + X'YZ + XY'Z'$
- 2a) $F(A,B,C,D,E) = A'B'D' + AD'E + B'C'D'$
 2b) $F(A,B,C,D,E) = A'B'D' + B'D'E' + B'CD' + CDE' + BDE'$
- 3) a) $A \oplus C$ b) $\overline{C} \cdot (\overline{A} \oplus B)$ c) $\overline{B} \oplus D$ d) $(\overline{A} \oplus C) \cdot (B \oplus D)$ e) $\overline{(B \oplus D) \oplus (A \oplus C)}$

2-13.

