

Homework #1

Homework assigned Tues 8 Nov to be collected on Tues 15 Nov

Problems from Chapter 2 - { pp 81 – 82 } ⁽¹⁾

2-3 Prove the identity of each of the following Boolean equations, using algebraic manipulation

(a) $\mathbf{A.B + B.C.D + \overline{A}.B.C + \overline{C}.D = B + \overline{C}.D}$ [10]

(b) $\mathbf{W.Y + \overline{W}.Y.\overline{Z} + W.X.Z + \overline{W}.X.\overline{Y} = W.Y + \overline{W}.X.\overline{Z} + \overline{X}.Y.\overline{Z} + X.\overline{Y}.Z}$ [10]

(c) $\mathbf{A.\overline{C} + \overline{A}.B + \overline{B}.C + \overline{D} = (\overline{A} + \overline{B} + \overline{C} + \overline{D}).(\overline{A} + B + C + \overline{D})}$ [10]

2-4 Given that $A.B = 0$ and $A + B = 1$, use algebraic manipulation to prove that

$$(\mathbf{A + C}).(\overline{\mathbf{A + B}}).(\mathbf{B + C}) = \mathbf{B.C}$$
 [10]

2-6 Simplify the following Boolean expressions to expressions containing a minimum number of literals:

(a) $\mathbf{\overline{A}.C + \overline{A}.B.C + \overline{B}.C}$ [5]

(b) $\mathbf{\overline{(A + B)}.(\overline{A} + \overline{B})}$ [5]

(c) $\mathbf{A.B.C + \overline{A}.C}$ [5]

(d) $\mathbf{B.C + B.(A.D + \overline{C}.D)}$ [5]

(e) $\mathbf{(B + \overline{C} + B.\overline{C}).(B.C + A.\overline{B} + A.C)}$ [5]

Problem from Chapter 3 {p 133} ⁽¹⁾

3-1 Design a circuit to implement the following pair of Boolean equations:

$$\begin{aligned}\mathbf{F} &= \mathbf{A.(C.\overline{E} + D.E) + \overline{A}.D} \\ \mathbf{G} &= \mathbf{B.(C.\overline{E} + D.E) + \overline{B}.C}\end{aligned}$$
 [15]

To simplify drawing the schematic, the circuit is to use hierarchy based on the factoring shown in the equation. Three instances (copies) of a single hierarchical circuit component made up of two AND gates, an OR gate and an inverter are to be used. Draw the logic diagram for the hierarchical component and for the overall circuit diagram using a symbol for the hierarchical component.

TOTAL POINTS [80]

Notes: (1) Approved textbook "Logic and Computer Design Fundamentals" M Morris Mano and Charles R Kime 3rd edition, Pearson Prentice-Hall ISBN 0-13-140539-X