Cpr E 281 HW04
ELECTRICAL AND COMPUTER ENGINEERING
IOWA STATE UNIVERSITY

Initial Stuff and Basics
Assigned Date: Fourth Week
Due Date: Sep. 23, 2013

P1. (10 points) Problem 2.36 in the textbook.

P2. (10 points) Problem 2.51 in the textbook.

P3. (10 points) Problem 2.52 in the textbook.

P4. (10 points) Problem 2.53 in the textbook.

P5. (10 points) Implement the following functions at the same time into one PLA with 3 inputs, four AND gates (in AND plane), and two OR gates in OR plane.

f1 = x1' x2' x3' + x1' x2 x3' + x1' x2' x3 + x1 x2 x3

f2 = x1' x2' x3' + x1 x2' x3' + x1' x2' x3 + x1 x2 x3

P6. (25 points) Use a K-map to simplify the following functions in SOP forms **as much as possible**:

(a) f(a) = Σ m(0,1)

(b) f(a,b,c) = Σ m(0,3,5,6)

(c) f(a,b,c) = a'bc' + a'b'c + a'bc + ab'c + abc

(d) f(a,b,c,d) = Σ m(0,2,5,8,9,10,12,13,14,15)

(e) f(a,b,c,d) = Σ m(1,7,9,10,11,12,13,15)

P7. (25 points) A four-variable function that is equal to 1 if any three or all four of its variables are equal to 1 is called a *majority* function.

(a) Write the truth table for the majority function.

(b) Use a K-map to derive the simplest expression for this majority function.

(c) Suppose that the input combinations with equal number of zeros and ones will never occur. Now simplify the function using a K-map.

(d) Derive the simplest expression for the majority function of part (c) by using a K-map and the product-of-sums form.

(e) Compare the costs of your answers to part (c) and part (d) in terms of the number of gates and inputs.