Cpr E 281 HW04
ELECTRICAL AND COMPUTER ENGINEERING
IOWA STATE UNIVERSITY

Minimization and Karnaugh Maps
Assigned Date: Fourth Week
Due Date: Sep. 22, 2014

P1. (10 points) Problem 2.53 in the textbook. You cannot use more than 10 gates.

P2. (10 points) Problem 2.51 in the textbook. Please make your circuit as simple as possible.

P3. (10 points) Problem 2.52 in the textbook. Please make your circuit as simple as possible.

P4. (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)

P5. (15 points) Use a K-map to simplify the following functions in POS forms **as much as possible**:
(b) f(a,b,c) = Π 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)

P6. (10 points) Problem 2.35 in the textbook. For part (b), please do it with the help of a K-map.

P7. (20 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 SOP expression for this majority function.
(c) Use a K-map to derive the simplest POS expression for this majority function.
(d) Compare the costs of the circuits implementing the expressions in part (b) and part (c) in terms of the total number of gates plus the total number of inputs.