Cpr E 281 RC07
WEEK 9
ELECTRICAL AND COMPUTER ENGINEERING
IOWA STATE UNIVERSITY

Recitation Material for Week 9
Tasks to do in the recitation section
Assigned Date: Eighth Week

T1. Review HW07 problems and solve any problems that the students point out they had difficulties with.

T2. Answer any general questions about HW08 and Lab 07.

T3. Solve the following problems.

1. Perform the addition of two 4-bit 2's complement numbers 1010+1011 and indicate if there is an overflow.

2. Using only 2-to-1 multiplexers, show how to implement the following function:

   f(A, B, C) = ∏ M(1,2,4)

3. Consider the following function:

   f(a, b, c, d, e) = ∑ m(3, 6, 7, 8, 12, 15, 24, 27, 30, 31) + d(4, 13, 14, 20, 22, 25, 26)

   Implement the above function using a 8-to-1 multiplexer and a minimal number of AND, OR and NOT gates. Assume that all variables are available in the true and complemented forms.

4. We would like to implement the following circuit:
   - The circuit has a 3-bit data input, A= a2 a1 a0.
   - The circuit has a 4-bit data output, B = b3 b2 b1 b0.
   - The circuit has a control input S:
     - When S=0, B=2A.
     - When S=1, B=A+1.

   (a) Implement the circuit using one 3-bit adder and a minimal number of AND, OR and NOT gates.
   (b) Implement the circuit using 3 half adders and a 4-bit 2-to-1 multiplexer.

5. Consider the following function:

   f(a, b, c, d) = a' b + a c d + b c' d' + a d'

   (a) Construct the truth table for f.
   (b) Implement f using one 4-to-16 decoder and a minimal number of gates.
   (c) Implement f using one 2-to-4 decoder and a minimal number of gates.
   (d) Implement f using one 8-to-1 multiplexer and a minimal number of gates.