Cosc 2P12
Assignment 1

(Due date for assignment is Monday October 12th,4:00 p.m. EST ., Late date Thursday October. 15, 4:00 p.m. EST)

You must show your rough work for each question to obtain full marks. Normally an answer without the necessary work showing how that answer was obtained will result in a minimal mark.

1). Convert the following using any method available.

a) 100100100001110 base 2 to base 3 (use division)
b) 0xC72 to base 2

2. Using 10's complement arithmetic, perform the following operations.

a) 145 - 129
b) 129 - 145

3. Use 2's complement arithmetic on the following signed integers to obtain the result

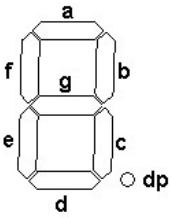
a) 000111 – 001100
b) 000111 – 101011

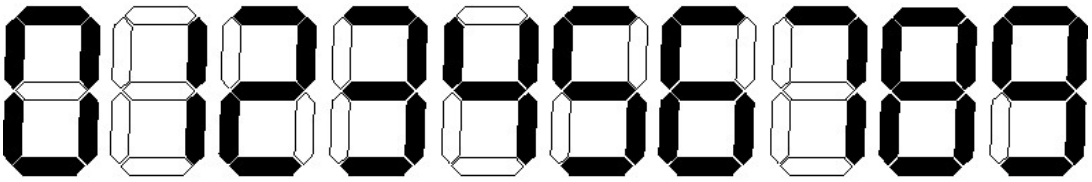
4. Given the following, use Boolean Algebra to reduce them to their simplified form. For each line of the production, state what law you are using to attain the result.

a) AC+C(A'+AB)
b) (A + B)'(C + D + E)' + (A + B)'

5. For part A and part B in the above question, implement the original and reduced form in Logic Circuit, both should use the same input, but have their own output. If you have reduced the equation correctly, the output should match between the reduced and non-reduced form. Drive the circuit using a sensor input which will run in series through all possible input values.

6. Electronic displays such as calculators will represent digits using a 7 segment configuration to approximate each of the digits. Below is a typical display and the digits it produces. We will ignore the decimal point for this exercise.

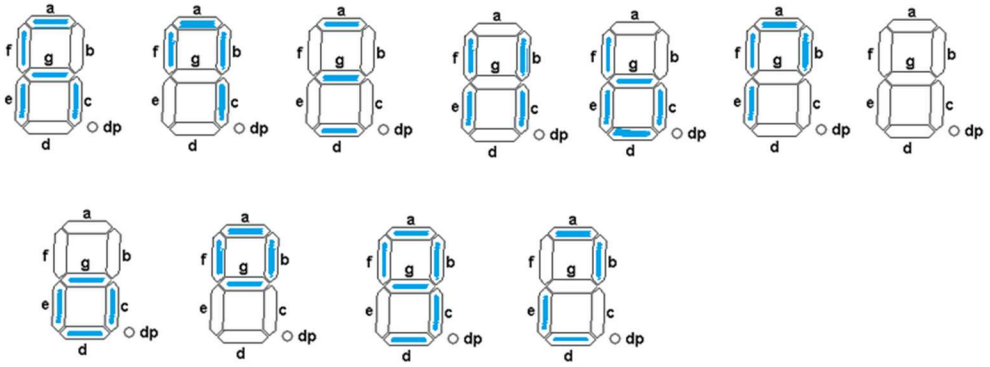




For example, the digit 4 has segments b,c,f and g lit. Internally, the device will receive a 4 bit binary code to represent these digits:

		D	C	B	A
4	=	0	1	0	0

The problem with the above representation is that it does not capture the true essence of your instructor's handwriting. Below are the digits as represented in BockBock code.



These comprise the digits 0 to 9, to be read from left to right, top to bottom.

a) Develop a multi-output truth table for lighting the segments. The truth table will have inputs D,C,B,A and outputs a,b,c,d,e,f,and g. Notice that the don't care conditions naturally arise, since 4 bits can encode 16 combinations, whereas the BockBock digits use only 10 states. Binary codes 1010 and above are not used.
b) Plot the light segment outputs **a** through **g** on four-variable K-Maps, and derive a simplified equation for each segment.

c) Create the above driver in logic circuit and show that it works by applying a sensor input which cycles though the inputs 0 to 9. For the output use an 8 segment display available on the menu. Output will produce BockBock as described above.

Submission

This submission will be submitted electronically. The written parts can be turned into a pdf. The logic circuit parts as a logic circuit project. For completeness, you can print the logic circuit – circuits and include them in the pdf as well. Better too much then not enough. Clearly label the parts of the project so the TA knows what to look for. Use text boxes within each cct to identify the cct. See labs. Thus, it will be your responsibility to ensure that it is printed to pdf and submitted in due course prior to the due date as listed above.

A portion of this assignment may be hand written/drawn as appropriate. Scanning or producing clear pictures in a readable and organized format may be used and converted to pdf. Please remember, that the marker must be able to read your writing and the electronic picture you take of it, so it is important things be done neatly. Make the marker happy!!!

For the electronic submission, use Sakai, an assignment 1 submission will be available.

- Printout of your logic circuit diagrams, with proper identification on each circuit printout. See lab 1.
- Neatly written/printed/typed assignment material. Labelled, page numbered.
- Logic Circuit project with clear labelling of parts, runnable. The TA will run your project to assign marks.

The End