Set of Tests

This set is designed for a four-credit course that covers the entire book.

There are nine tests, each scheduled for 50 to 60 minutes. I usually drop the lowest grade.

There is a final exam, scheduled for two hours, 50 minutes.

Test 1

1. Convert the decimal number 332 to binary. Show your work.

2. Add the two binary numbers; show both operands and the result in decimal as well as binary. (Be sure to show the carry as you add.)

```
  0 1 0 1 1 0
+ 0 1 1 1 0 0
```

3. Show the decimal equivalent of each of the numbers if they are interpeted as (six answers)

1 0 0 0 0 1 1 1 0 1 0 1 0 1 1 0

a) Unsigned binary
b) Signed binary
c) BCD (8421 code)

4. Add the two pairs of signed (two's complement) numbers. Be sure to show the carry as you add. Show both operands and the result of each addition in decimal as well as binary.

```
  1 1 0 0        1 0 1 0
+ 1 1 0 1      + 0 1 1 1
```

5. Compute the difference of the signed numbers
   a) 0 1 1 0 - 0 0 1 1 b) 0 0 1 0 - 1 1 0 1
Show the work and indicate both the binary and decimal values.

6. The inputs of this system A and B represent one binary number in the range 0:3. The inputs C and D represent a second binary number (also in the range 0:3). There are three outputs, X, Y and Z.
Show a truth table such that Y and Z represent a number equal to the the first minus the second (if that is non-negative) and X is 1 if and only if the first is larger. If the second is larger than the first, X is 0, and Y and Z don't matter.

7. Reduce the expression below to a sum of products expression with two terms and four literals. Show each step.

x' y' z' + x' y z' + x' y z + x y z

8. Use a truth table to demonstrate whether or not the following functions are equal. (Be sure to state which, if any, are equal.)

$$f = a\,b' + b'\,c' + a\,c$$
$$g = (b' + c)\,(a + b + c')$$
$$h = b'\,c' + b\,c + a\,c$$

9. Reduce the expression below to a sum of products expression with three terms and six literals. Show each step. 5 point bonus for a second solution.

$$a'\,b'\,c' + a'\,b\,c' + a'\,b\,c + a\,b'\,c' + a\,b'\,c + a\,b\,c$$

10. For each part, assume all variables are available both uncomplemented and complemented.

$$f = x\,z + w\,x + w'\,y\,z + w\,y'\,z'$$

a) Show a block diagram for a two-level implementation of f using AND and OR gates.

b) Show a block diagram for an implementation of f using only two-input AND and OR gates.