The entire exam is to be turned in at 5:45 PM. Work the closed book section first and turn it in before you consult your books and notes to work on the open book section. The use of calculators is forbidden during the closed book section of the exam.

Name: 

Problem 1. (4 points)
Convert the following numbers into twelve-bit two's complement binary numbers:

-400
300

Problem 2. (4 points)
Convert the following ten-bit two's complement binary numbers into signed decimal numbers:

1111101100
0011000110

Problem 3. (2 points)
How many bytes are contained in a 4k × 16 memory?

Problem 4. (4 points)
In the right side of the space below, draw the gate-level implementation of the Boolean function

\[ F(x, y, z) = x + y' z + x' \]

using the standard representation of logic gates.

Problem 5. (4 points)
In the left side of the space above, draw a high-level block diagram of an 8-bit shift register with parallel load.
Problem 6. (3 points)
Draw a truth table for the Boolean exclusive OR operation.

Problem 7. (4 points)
Simplify the following Boolean expressions
\[ x + x y = \]
\[ x (x + y) = \]

Problem 8. (2 points)
What is the following Boolean identity called
\[ x + (y + z) = (x + y) + z \]

Problem 9. (4 points)
How are the following circuit elements used in computer hardware?
- flip-flops
- multiplexers

Problem 10. (4 points)
What do the following acronyms stand for
- RAM
- RISC
- ROM
- RTL

Problem 11. (2 points)
What is the name of the program used to simulate circuits in CSCI 254?

Problem 12. (3 points)
What are the two common methods of implementing the control unit of a computer?