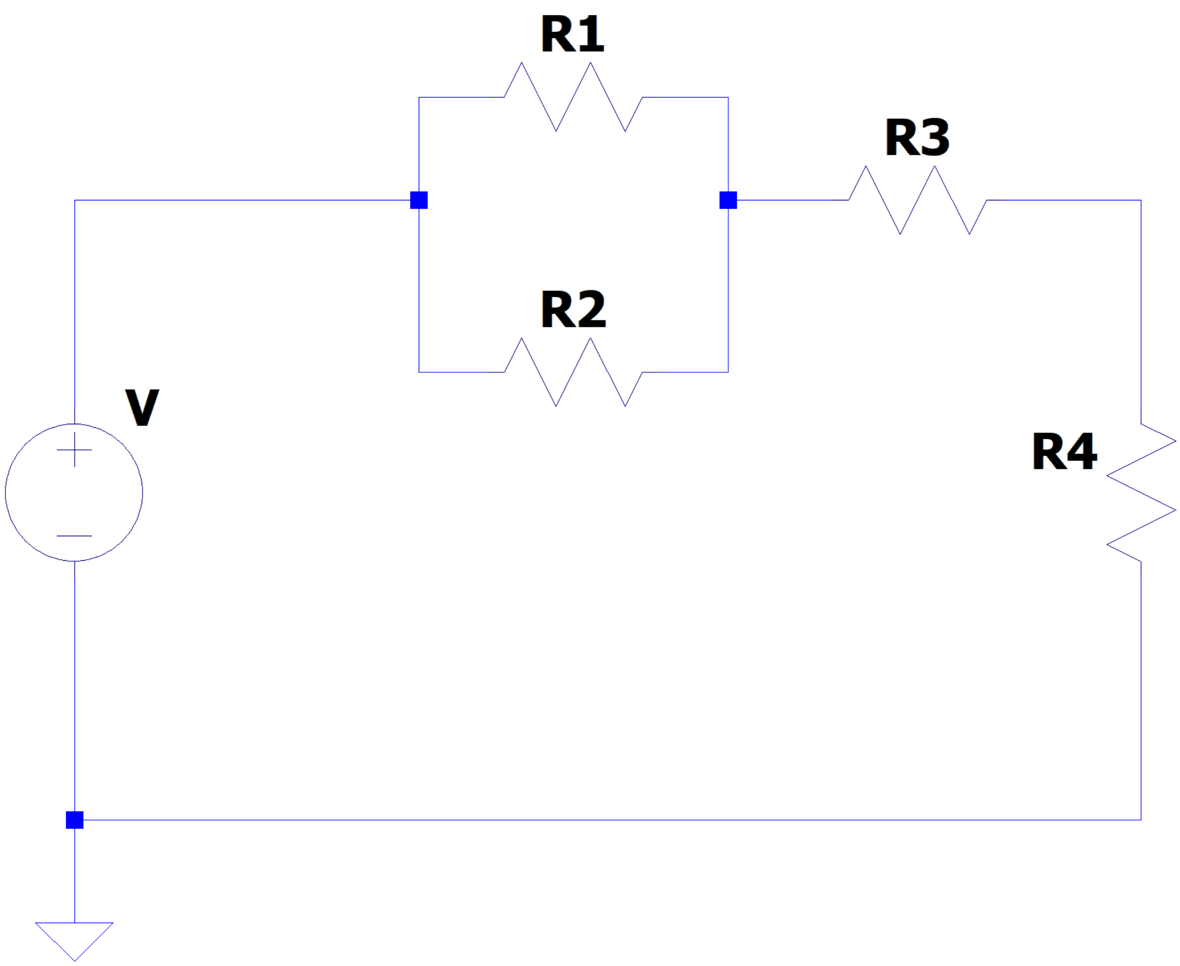
CSE 2301 Exam 1 Review

Module 1: Introduction to Circuit Principles:

1. Given the circuit below:



V = 10V, R1 = 50 Ω, R2 = 50 Ω, R3 = 100 Ω, R4 = 150 Ω

   a. What is the equivalent resistance of the circuit?

   b. What is the total current running through the circuit?

   c. How much power is being dissipated through resistor R4?

2. There are three resistors in a circuit with equivalent resistance of R_{eq} = 75 Ω. Two resistors are in parallel, and their combination is in series with another. One of the parallel resistors has a value of 60 Ω, and the series resistor has a value of 25 Ω. Find the value of the other parallel resistor.

Module 2: Introduction to Digital Logic:

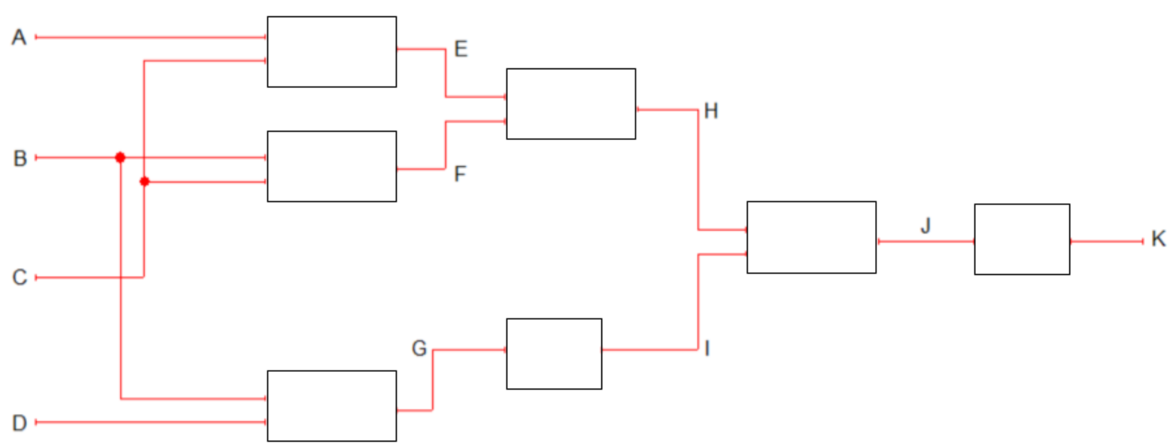
3. Draw the positive logic truth tables for an AND gate, an OR gate, and a NOT gate.

4. What would the above truth tables look like with negative logic?

5. What do SSI, MSI, LSI, and VLSI stand for, and what are they used to describe?

6. Define the low, undefined, and high voltage ranges for TTL. What does it mean if we have a voltage in the “undefined” range?

7. Given the following information:



E = A*B, F = B + C, G = B + D, H = E*F, I = G’, J = H + I, K = J’

a. Fill in the blank boxes with the correct gate symbols
b. Draw the truth tables for variables H, I, and K.
   Hint: You may want to start with other variables first to make the later ones easier.

Module 3: Number Systems Including Positive and Negative Representation:

8. In this question, we are concerned with five number systems: decimal, binary, ternary, octal, and hexadecimal. You will receive a number in one of these systems. Please represent it in each of the other four.

    a. 47_{10}

    b. 10110111_2

    c. 213_3

    d. 87_8

    e. $1F3_{16}$

9. Convert the number -13.375 to IEEE 754 32-bit precision floating point format. Show detailed calculations.

10. Perform the following calculations with unsigned binary numbers:

    a. 10110111 + 01000111

    b. 10110111 - 01000111

11. Write the following numbers in 8 bit binary both as signed magnitude and 2's complement. Then, add their 2's complement versions together.

    a. -43_{10}

    b. $+26_{10}$

12. How are MSB's related to the addition of two numbers causing an overflow?

Module 4: Logical Functions Including Switching Algebra and Codes:

13. Why do we use gray code? Is there another gray code you could make? If so, please write the numbers from 0-7 in binary, the normal gray code, and your code.

14. Use DeMorgan's Theorem to show how (A(B+C)+D)' can be implemented with only NAND gates.

15. Convert the numbers 0-9 from binary (0000-1001) to XS3. Why is the total range of XS3 -3_{10} to 12_{10}?

16. Why do we use BCD? What are its advantages?

17. What are minterms, and how are they related to truth tables and the creation of logic equations?

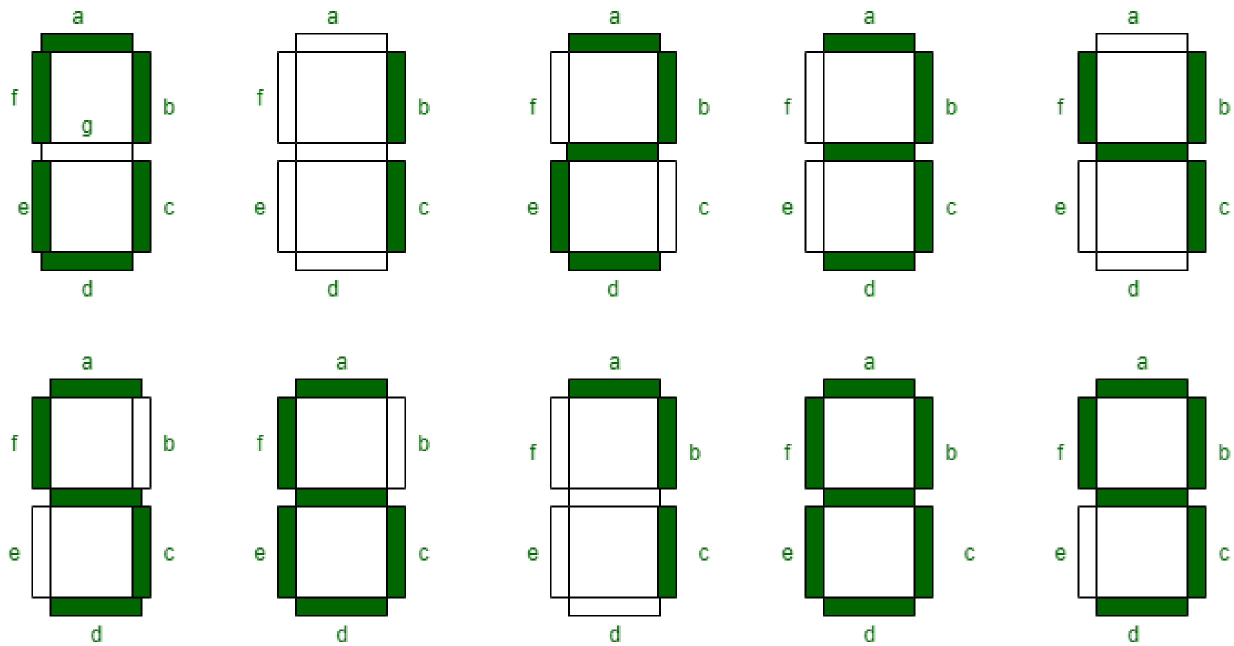
18. Draw the truth table for an XOR gate, as well as its gate symbol. What do you think could be a potential use for this kind of function?

19. What are the symbols used to represent AND, OR, NOT, and XOR in logic equations? As an example, write the following statement as an equation without simplifying:

    (A OR B) XOR (NOT(C AND D))

Module 5: Karnaugh Maps:

20. A seven-segment display is commonly associated with alarm clocks, and it can display the numbers 0-9 in the following way:



You'll notice that each segment is labelled a-g. Using Karnaugh Maps, create minimized equations for each segment, or as many segments as you feel you need to become confident in creating these maps and equations. It may help to create a truth table first, with DCBA as a binary input representing the decimal number you want to display. Assume a green segment in the picture above is a 1, and a white segment is a 0.

Module 5.5: Quine-McCluskey (Tabular) Method:

21. Use the Quine-McCluskey Method to create a minimized equation for the following function of minterms:

$$f = \sum 0, 1, 2, 5, 7, 8, 9, 10, 14$$