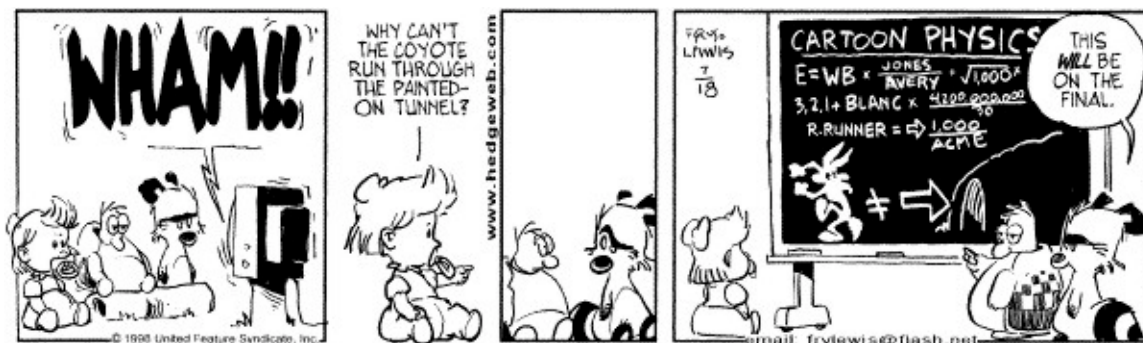# EE 302, Introduction to Electrical and Computer Engineering

Dr. Archie Holmes, Jr.

Exam #2

Name: _____

SSN: _____

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Please remember….

- **Read the entire exam before starting**

- **If you feel you need more information than is given, please ask!!!**

- **Show all work for credit!!!**

- **Relax!!!**

This exam contains 8 pages and 5 problems along with some extra credit questions
Give units to all answers where applicable

Problem #1   _____

Problem #2   _____

Problem #3   _____

Problem #4   _____

Problem #5   _____

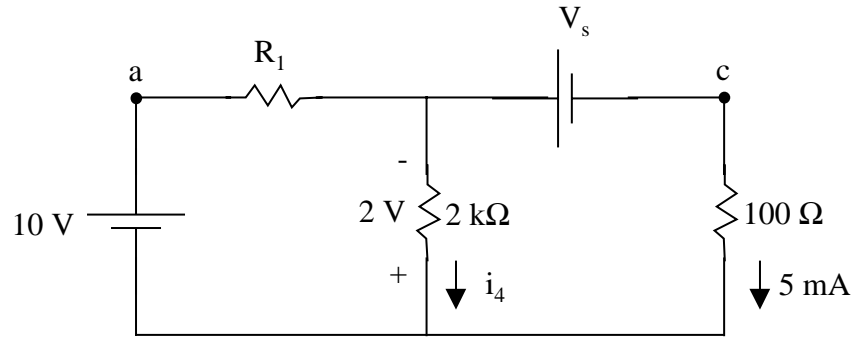Bonus (Extra Credit)   _____

Total   _____

This information will be provided when I return the exam

Class Average =   _____

Standard Deviation =   _____

PROBLEM #1. DEFINITIONS (18 POINTS). USE ADDITIONAL SHEETS AS NEEDED.

a)   Using KVL, KCL, and Ohm's law solve for the unknown quantities in the circuit below. **Show your work for credit!!**

$V_s =$ _____ V $i_4 =$ _____ mA

$R_1 =$ _____ Ω $V_{ac}=$ _____ V

b)   Explain the difference between and ideal voltage source and a real voltage source.

c)   Calculate the power absorbed by a 100 Ω resistor when $9.5 \cdot 10^{17}$ electrons are flowing **into it** every 5 seconds.

PROBLEM #2. POWER IN ELECTRICAL CIRCUITS (20 POINTS). USE ADDITIONAL SHEETS AS NEEDED.

Calculate the power for each element in the circuit below and show that power is conserved. **Clearly mark** on the circuit the directions you are assuming for the voltages and the currents.
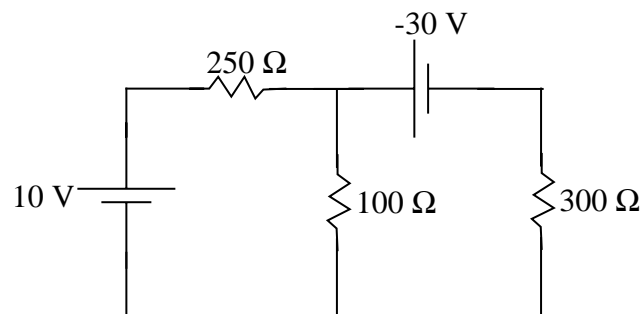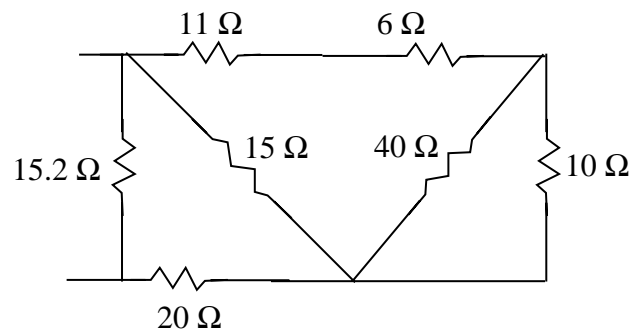
PROBLEM #3. GENERAL CIRCUIT ANALYSIS (20 POINTS). USE ADDITIONAL SHEETS AS NEEDED.

Calculate the *change* in the current flowing through the 30 Ω resistor when the switch changes from the open position to the closed position. **Clearly mark** on the circuit the directions you are assuming for current flow.
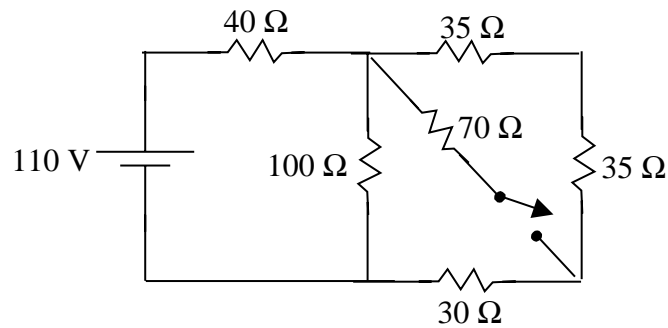
PROBLEM #4. EQUIVALENT RESISTANCE (15 POINTS)

a) Write a one-line expression for R_{eq} of this circuit.

b) Evaluate R_{eq} for the same circuit.

PROBLEM #5. SUBDIVISION DESIGN (27 POINTS)

You are the head electrical engineer for a construction company who is building houses in a subdivision. The initial plans call for 100 houses which each need 5 KW of power at 120 V for proper operation. The power plant chosen for this subdivision provides a **maximum** of 2 MW of power at 210 V. For the purposes of this problem assume that the power plant is ideal and that the houses need this power at all times.

a) Draw an electrical circuit representation for how 3 houses would be connected to the power plant. Your diagram must met the requirements listed above and the power plant should be the only source of power in the diagram. Explain briefly how additional house would be added.

b) What percentage of the power being delivered by the power plant is absorbed by the houses.

c) The contractor has decided to add a phase-II to the subdivision which will use more energy efficient houses. In this case, these houses need 3 KW of power at a voltage of 120 V. How many of these houses can be added using the existing power plant.

Bonus (4 points): With the addition of the new houses what is the new percentage of power being delivered by the power plant to the houses.

EXTRA CREDIT (3 POINTS TOTAL)

1. Name the men's and women's NCAA Championships which took place last weekend.

    Men's: _____

    Women's: _____

2. On what date did NATO begin air strikes on the Federal Republic of Yugoslavia. (Circle one)

    a) March 29, 1999
    b) March 27, 1999
    c) March 26, 1999
    d) March 24 1999
    e) March 21, 1999