ECE 100 (Spring 2021) - Homework #1

Due Date: Sunday, April 4th @ 4pm PDT

Problem 1 (5 points)

P1.12. The current through a particular circuit element is given by $i(t)=10\sin(200\pi t)$ A in which the angle is in radians.

a. Sketch *i(t)* to scale versus time.
b. Determine the net charge that passes through the element between $t=0$ and $t=5$ ms.
c. Repeat for the interval from $t=0$ to $t=10$ ms.

Problem 2 (10 points)

P1.24. The element shown in **Figure P1.24** has $v(t)=10$ V and $i(t)=2e^{-t}$ A. Compute the power for the circuit element. Find the energy transferred between $t=0$ and $t=\infty$. Is this energy absorbed by the element or supplied by it?

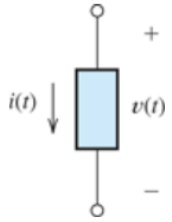

Figure P1.24

Problem 3 (10 points)

***P1.42.** Use KVL to solve for the voltages v_a, v_b, and v_c in **Figure P1.42**.

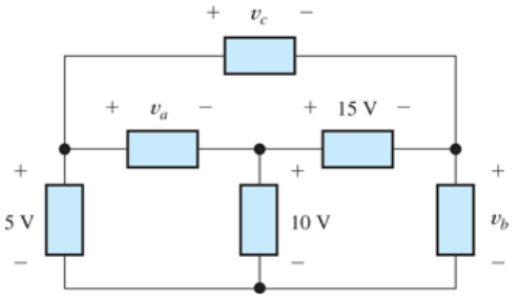

Figure P1.42

Problem 4 (10 points)

***P1.55.** A power of 100 W is delivered to a certain resistor when the applied voltage is 100 V. Find the resistance. Suppose that the voltage is reduced by 10 percent (to 90 V). By what percentage is the power reduced? Assume that the resistance remains constant.

Problem 5 (20 points)

P1.63. Consider the circuit shown in **Figure P1.63**. Find the current i_R flowing through the resistor. Find the power for each element in the circuit. Which elements are receiving power?

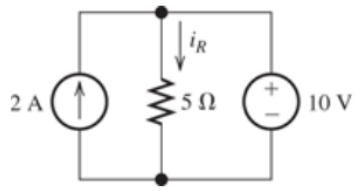

Figure P1.63

Problem 6 (20 points)

P1.71. Determine the value of v_x and i_y in the circuit shown in **Figure P1.71**.

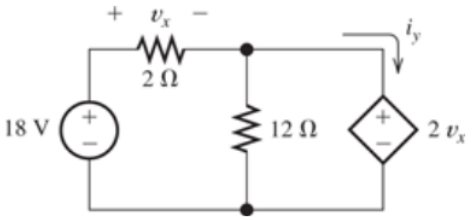

Figure P1.71

Problem 7 (25 points)

P1.74. Consider the circuit shown in **Figure P1.74**.

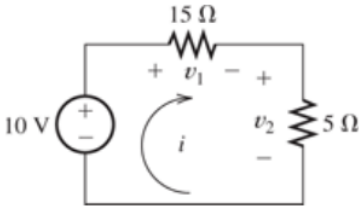

Figure P1.74

a. Use KVL to write an equation relating the voltages.
b. Use Ohm's law to write equations relating v_1 and v_2 to the current i.
c. Substitute the equations from part (b) into the equation from part (a) and solve for i.
d. Find the power for each element in the circuit and verify that power is conserved.