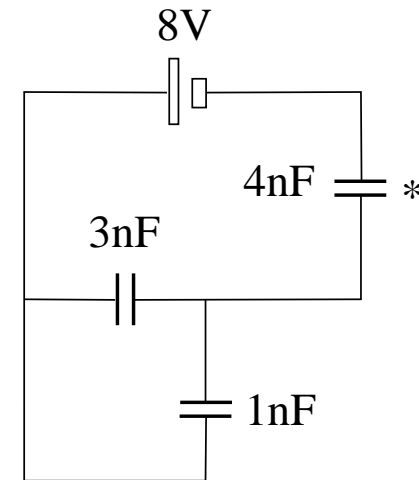
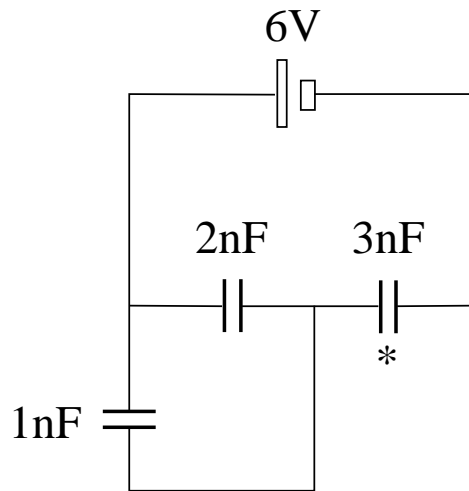


Unit Exam II: Problem #1 (Fall '15)



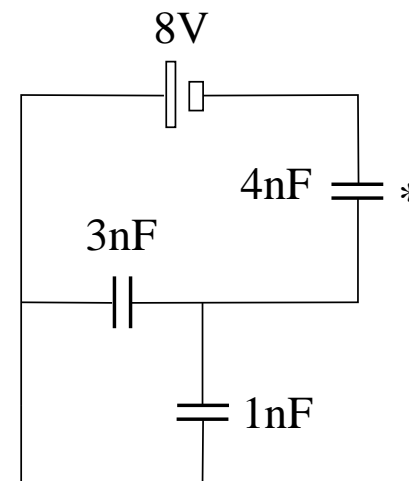
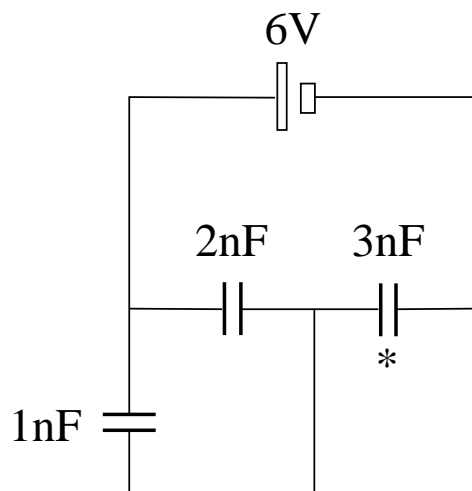
Consider the capacitor circuit shown at equilibrium. (a) Find the equivalent capacitance C_{eq} . (b) Find the total energy U stored in the three capacitors. (c) Find the voltage V_* across the capacitor marked by an asterisk. (d) Find the voltage V_1 across the 1nF-capacitor.



Unit Exam II: Problem #1 (Fall '15)



Consider the capacitor circuit shown at equilibrium. (a) Find the equivalent capacitance C_{eq} . (b) Find the total energy U stored in the three capacitors. (c) Find the voltage V_* across the capacitor marked by an asterisk. (d) Find the voltage V_1 across the 1nF-capacitor.



Solution:

$$(a) C_{eq} = \left(\frac{1}{1\text{nF} + 2\text{nF}} + \frac{1}{3\text{nF}} \right)^{-1} = 1.5\text{nF}$$

$$(b) U = \frac{1}{2} (1.5\text{nF})(6\text{V})^2 = 27\text{nJ}$$

$$(c) V_* = \frac{1}{2} 6\text{V} = 3\text{V}$$

$$(d) V_1 = 6\text{V} - 3\text{V} = 3\text{V}$$

$$(a) C_{eq} = \left(\frac{1}{3\text{nF} + 1\text{nF}} + \frac{1}{4\text{nF}} \right)^{-1} = 2\text{nF}$$

$$(b) U = \frac{1}{2} (2\text{nF})(8\text{V})^2 = 64\text{nJ}$$

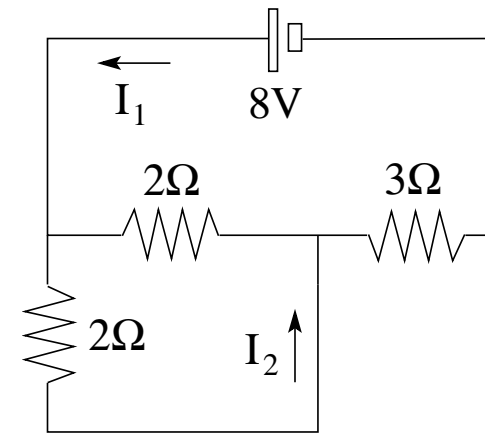
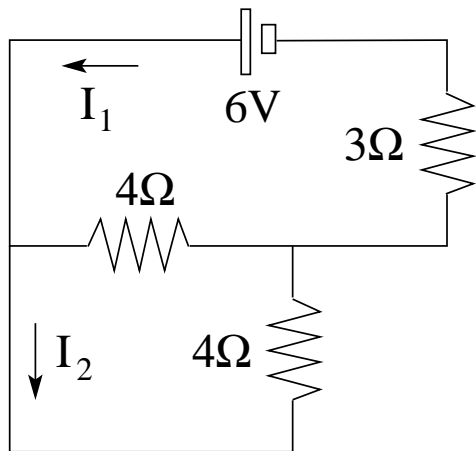
$$(c) V_* = \frac{1}{2} 8\text{V} = 4\text{V}$$

$$(d) V_1 = 8\text{V} - 4\text{V} = 4\text{V}$$

Unit Exam II: Problem #2 (Fall '15)



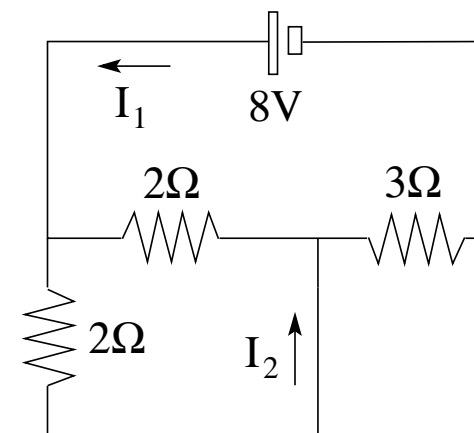
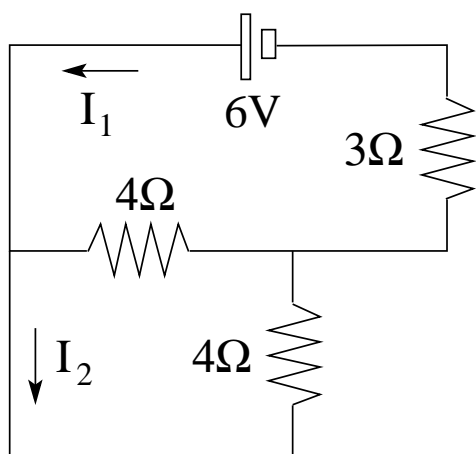
Consider the resistor circuit shown. (a) Find the equivalent resistance R_{eq} . (b) Find the currents I_1 and I_2 . (c) Find the power P supplied by the battery.



Unit Exam II: Problem #2 (Fall '15)



Consider the resistor circuit shown. (a) Find the equivalent resistance R_{eq} . (b) Find the currents I_1 and I_2 . (c) Find the power P supplied by the battery.



Solution:

$$(a) R_{eq} = \left(\frac{1}{4\Omega} + \frac{1}{4\Omega} \right)^{-1} + 3\Omega = 5\Omega$$

$$(b) I_1 = \frac{6V}{5\Omega} = 1.2A, \quad I_2 = \frac{1}{2}I_1 = 0.6A$$

$$(c) P = (1.2A)(6V) = 7.2W$$

$$(a) R_{eq} = \left(\frac{1}{2\Omega} + \frac{1}{2\Omega} \right)^{-1} + 3\Omega = 4\Omega$$

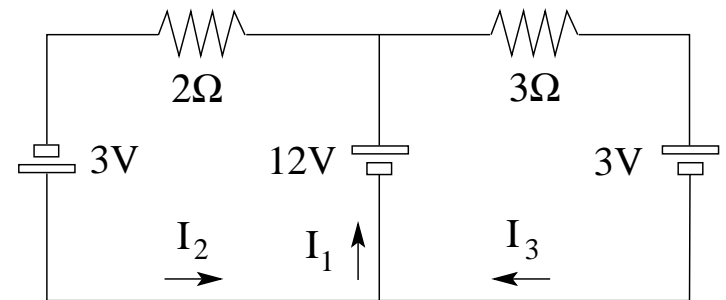
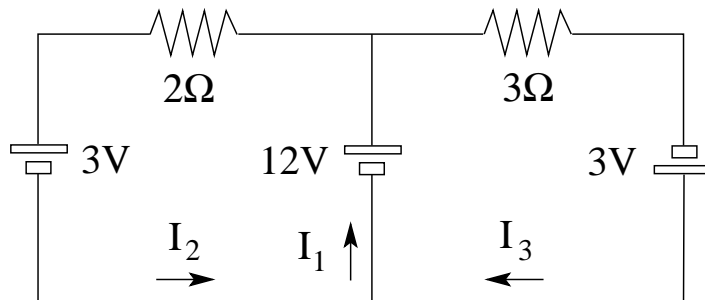
$$(b) I_1 = \frac{8V}{4\Omega} = 2A, \quad I_2 = \frac{1}{2}I_1 = 1A$$

$$(c) P = (2A)(8V) = 16W$$

Unit Exam II: Problem #3 (Fall '15)



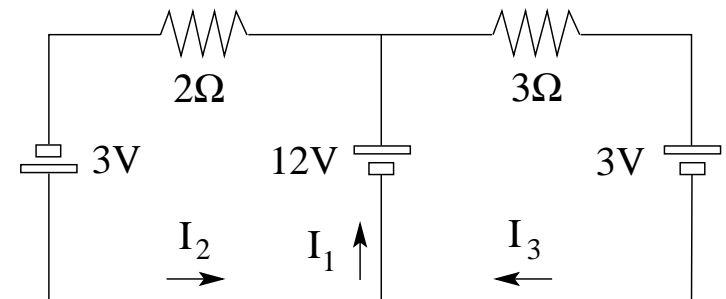
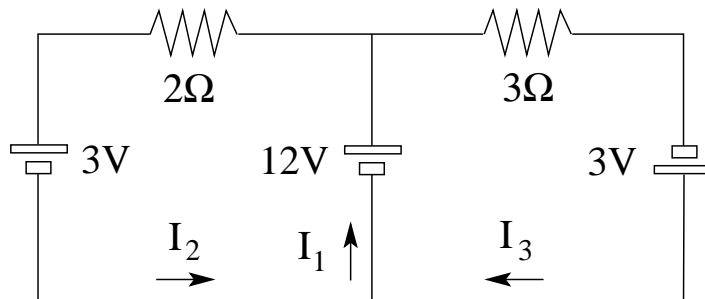
Consider the electric circuit shown.
Find the currents I_1 , I_2 , I_3 .



Unit Exam II: Problem #3 (Fall '15)



Consider the electric circuit shown.
Find the currents I_1 , I_2 , I_3 .



Solution:

$$12V - I_2(2\Omega) - 3V = 0$$

$$\Rightarrow I_2 = \frac{9V}{2\Omega} = 4.5A$$

$$12V - I_3(3\Omega) + 3V = 0$$

$$\Rightarrow I_3 = \frac{15V}{3\Omega} = 5A.$$

$$I_1 = I_2 + I_3 = 9.5A$$

$$12V - I_2(2\Omega) + 3V = 0$$

$$\Rightarrow I_2 = \frac{15V}{2\Omega} = 7.5A.$$

$$12V - I_3(3\Omega) - 3V = 0$$

$$\Rightarrow I_3 = \frac{9V}{3\Omega} = 3A.$$

$$I_1 = I_2 + I_3 = 10.5A$$