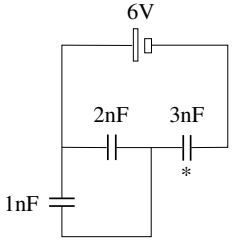
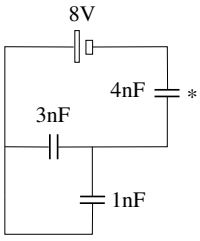
Unit Exam II: Problem #1 (Fall '15)

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.





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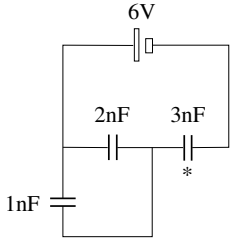

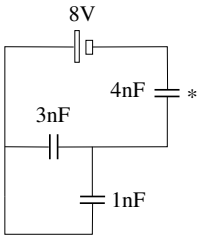

Solution:

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

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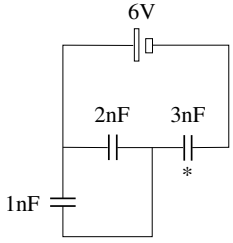

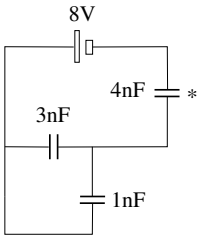

Solution:

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

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

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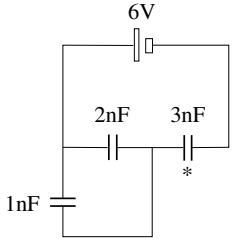

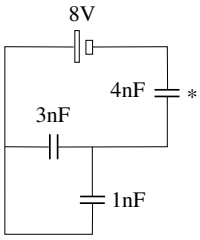

Solution:

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

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

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

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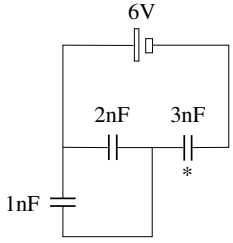
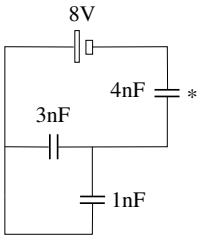
Consider the capacitor circuit shown at equilibrium. (a) Find the equivalent capacitance C_{eq}. (b) Find the total energy U stored in the three capacitors. (c) Find the voltage V_* across the capacitor marked by an asterisk. (d) Find the voltage V_1 across the 1nF-capacitor.





Solution:

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

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

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

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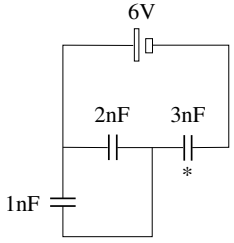
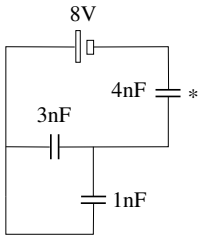
Consider the capacitor circuit shown at equilibrium. (a) Find the equivalent capacitance C_{eq}. (b) Find the total energy U stored in the three capacitors. (c) Find the voltage V_* across the capacitor marked by an asterisk. (d) Find the voltage V_1 across the 1nF-capacitor.





Solution:

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

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

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

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

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

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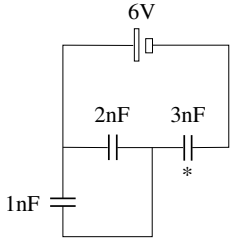
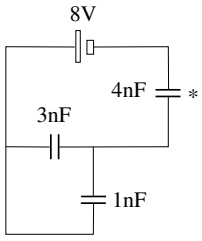
Consider the capacitor circuit shown at equilibrium. (a) Find the equivalent capacitance C_{eq}. (b) Find the total energy U stored in the three capacitors. (c) Find the voltage V_* across the capacitor marked by an asterisk. (d) Find the voltage V_1 across the 1nF-capacitor.





Solution:

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

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

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

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

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

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

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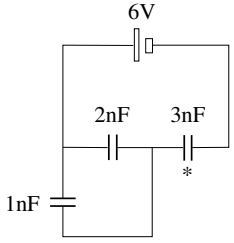

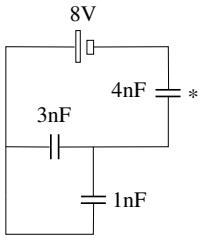

Solution:

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

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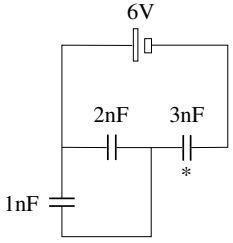

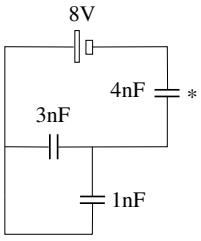

Solution:

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

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

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

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

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

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