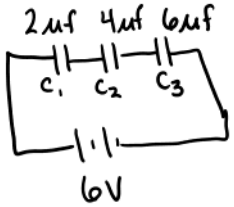
Series and Parallel Circuits

Thursday, April 24, 2014 6:51 AM

Example

- Solve the following circuit. Find q1, q2, q3 and v1, v2, and v3.



Collapse and find q_{eq}

$V_B = V_1 + V_2 + V_3$

$q_{eq} = q_1 = q_2 = q_3$

$\frac{1}{C_{eq}} = \frac{1}{C_1} + \frac{1}{C_2} + \frac{1}{C_3}$

$\frac{1}{C_{eq}} = \frac{1}{2} + \frac{1}{4} + \frac{1}{6}$

$= \frac{6}{12} + \frac{3}{12} + \frac{2}{12} = \frac{11}{12}$

$C_{eq} = \frac{12}{11}$ uf

$C_{eq} = \frac{q_{eq}}{V_B}$

$q_{eq} = C_{eq} \cdot V_B$

$= \frac{12}{11} \times 10^{-6} \cdot 6 = 6.55 \times 10^{-6}$ C

$q_1 = 6.55 \times 10^{-6}$ C

$q_2 = 6.55 \times 10^{-6}$ C

$q_3 = 6.55 \times 10^{-6}$ C

$C = q/V$

$V = q/C$

$V_1 = q_1/C_1 = \frac{6.55 \times 10^{-6}}{2 \times 10^{-6}} = 3.27$ V

$V_2 = q_2/C_2 = \frac{6.55 \times 10^{-6}}{4 \times 10^{-6}} = 1.64$ V

$V_3 = q_3/C_3 = \frac{6.55 \times 10^{-6}}{6 \times 10^{-6}} = 1.09$ V

$V_B = 3.27 + 1.64 + 1.09 = 6$

Example Problem – Parallel Circuits

- Analyze the following circuit and find V1, V2, and V3 and q1, q2, and q3.

$V_B = V_1 = V_2 = V_3$

$q_{eq} = q_1 + q_2 + q_3$

$C_{eq} = C_1 + C_2 + C_3$

$C_{eq} = 2 + 4 + 6 = 12\,\mu f$

$C = Q/V$

$Q_{eq} = C_{eq} V_B = 12 \times 10^{-6} \cdot 6$

$= 72 \times 10^{-6}\,C$

$7.2 \times 10^{-5}\,C$

$V_1 = 6V$

$V_2 = 6V$

$V_3 = 6V$

$C = q/V$

$q = C \cdot V$

$q_1 = C_1 V_1 = 2 \times 10^{-6} \cdot 6 = 12 \times 10^{-6}\,C$

$q_2 = C_2 V_2 = 4 \times 10^{-6} \cdot 6 = 24 \times 10^{-6}\,C$

$q_3 = C_3 V_3 = 6 \times 10^{-6} \cdot 6 = 36 \times 10^{-6}\,C$

$q_{eq} = q_1 + q_2 + q_3$

$72 \times 10^{-6} \stackrel{?}{=} 12 \times 10^{-6} + 24 \times 10^{-6} + 36 \times 10^{-6}$

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