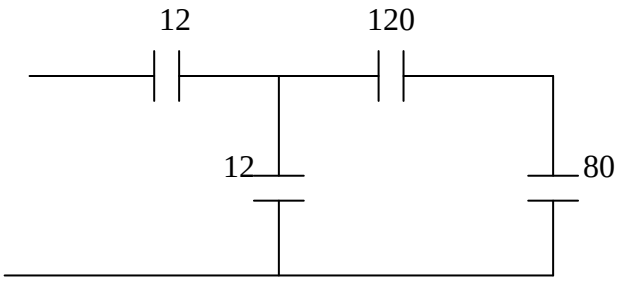
Chapter 6, Solution 19.

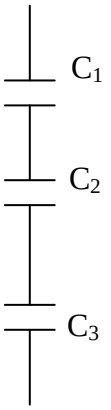
We combine 10-, 20-, and 30- μF capacitors in parallel to get 60 μF. The 60 - μF capacitor in series with another 60- μF capacitor gives 30 μF.
30 + 50 = 80 μF, 80 + 40 = 120 μF
The circuit is reduced to that shown below.



120- μF capacitor in series with 80 μF gives (80x120)/200 = 48
48 + 12 = 60
60- μF capacitor in series with 12 μF gives (60x12)/72 = **10 μF**

Chapter 6, Solution 20.

Consider the circuit shown below.



$C_1 = 1+1 = 2\mu F$
$C_2 = 2+2+2 = 6\mu F$

$C_3 = 4x3 = 12\mu F$

$1/C_{eq} = (1/C_1) + (1/C_2) + (1/C_3) = 0.5 + 0.16667 + 0.08333 = 0.75x10^6$

C_{eq} = **1.3333 µF**.

Chapter 6, Solution 21.

4μF in series with 12μF = (4x12)/16 = 3μF
3μF in parallel with 3μF = 6μF
6μF in series with 6μF = 3μF
3μF in parallel with 2μF = 5μF
5μF in series with 5μF = 2.5μF

Hence C_{eq} = **2.5μF**

Chapter 6, Solution 29.

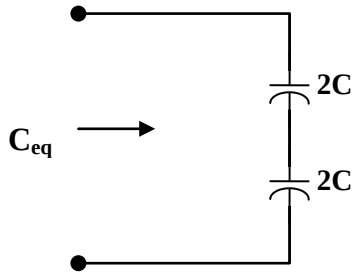
(a) C in series with C = C/(2)

C/2 in parallel with C = 3C/2

$$\frac{3C}{2} \text{ in series with } C = \frac{Cx\frac{3C}{2}}{5\frac{C}{2}} = \frac{3C}{5}$$

$$3\frac{C}{5} \text{ in parallel with } C = C + 3\frac{C}{5} = \underline{\mathbf{1.6\ C}}$$

(b)



$$\frac{1}{C_{eq}} = \frac{1}{2C} + \frac{1}{2C} = \frac{1}{C}$$

C_{eq} = **1 C**

Chapter 6, Solution 30.

$$v_o = \frac{1}{C}\int_o^t i\,dt + i(0)$$

For $0 < t < 1$, $i = 60t$ mA,

$$v_o = \frac{10^{-3}}{3x10^{-6}}\int_o^t 60t\,dt + 0 = 10t^2 \text{kV}$$

$$v_o(1) = 10\text{kV}$$

For $1 < t < 2$, $i = 120 - 60t$ mA,

$$v_o = \frac{10^{-3}}{3x10^{-6}}\int_1^t (120 - 60t)\,dt + v_o(1)$$

$$= [40t - 10t^2]\Big|_1^t + 10\text{kV}$$

$$= 40t - 10t^2 - 20$$

$$v_o(t) = \begin{cases} 10t^2\text{kV}, & 0 < t < 1 \\ 40t - 10t^2 - 20\text{kV}, & 1 < t < 2 \end{cases}$$