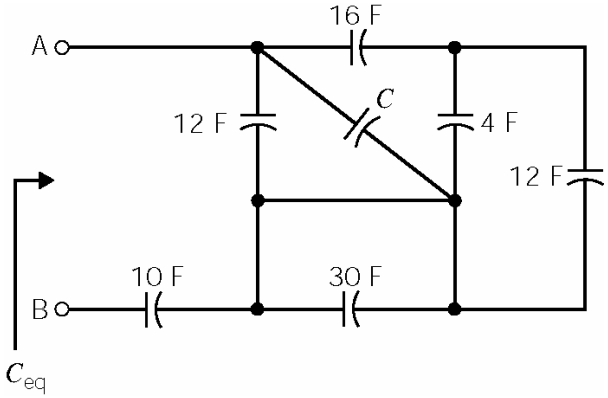
**Example:**

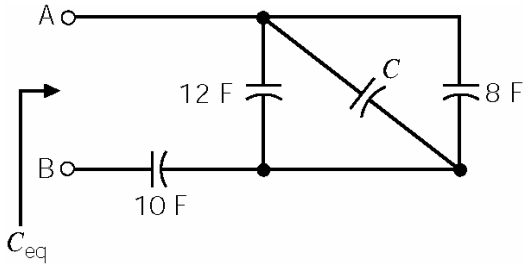



This circuit is equivalent to a single capacitor having capacitance $C_{eq} = 8$ F. Determine the value of the capacitance *C*

**Solution:**
The 16 F capacitor is in series with a parallel combination of 4 F and 12 F capacitors. The capacitance of the equivalent capacitor is

$$\frac{16(4+12)}{16+(4+12)} = 8 \text{ F}$$

The 30 F capacitor is in parallel with a short circuit, which is equivalent to a short circuit. After making these simplifications, we have




Then

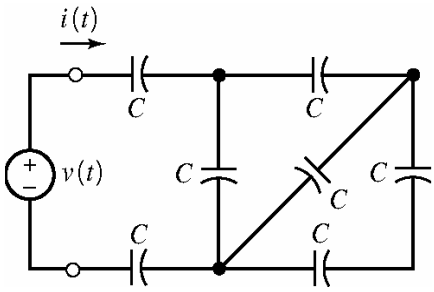
$$8 = C_{eq} = \frac{10(12+C+8)}{10+(12+C+8)} \quad \Rightarrow \quad C = 20 \text{ F}$$

**Example:**

This circuit contains 7 capacitors each having capacitance *C*. The voltage source voltage is given by

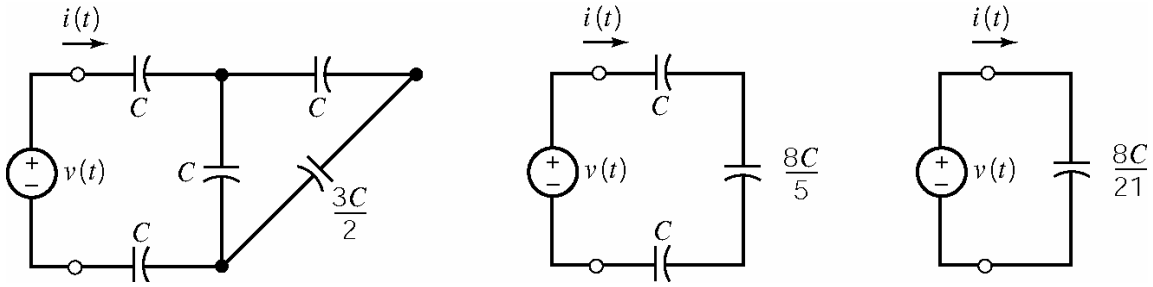
$$v(t) = 4\cos(3t) \text{ V}$$

Find the current $i(t)$ when $C$ = 1 F.




**Solution:**

Replacing series and parallel capacitors by equivalent capacitors, the circuit can be reduced as follows:




Then

$$i(t) = \frac{8C}{21}\frac{d}{dt}v(t) = \frac{8C}{21}\frac{d}{dt}4\cos(3t) = \frac{8\times 1}{21}\left[-12\sin(3t)\right] = -\frac{32}{7}\sin(3t) \text{ V}$$