Electric Circuits

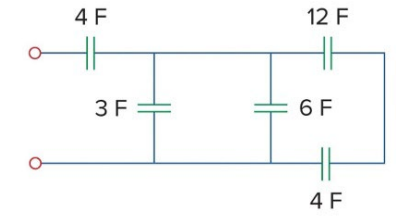
Homework Set 12

1. If the voltage across a 7.5 F capacitor is $2te^{-3t}$ V, find the current and the power.

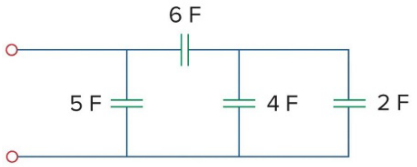
2. A current of $4\sin(4t)$ (in amps) flows through a 5 F capacitor. Find the voltage $v(t)$ across the capacitor given that $v(0)$ = 1 V.

3. The current through a 0.5 F capacitor is $6(1 - e^{-t})$ *A*. Determine the voltage and power at t = 2 *s*. Assume $v(0)$ = 0.

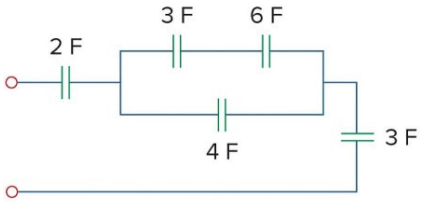
4. Determine the equivalent capacitance for each of the following circuits.



(a)

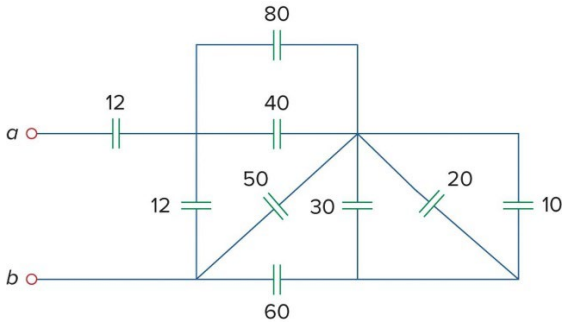


(b)

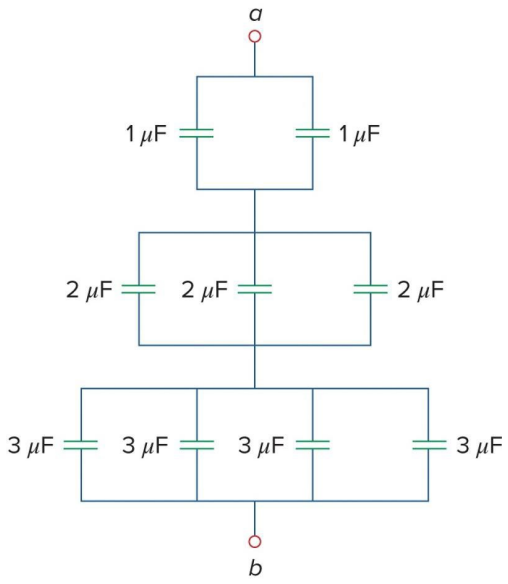


(c)

5. Find the equivalent capacitance between the terminals *a* and *b* in the circuit below. (All capacitances are in μF).



6. Find the equivalent capacitance at terminals *a*-*b* of the following circuit.



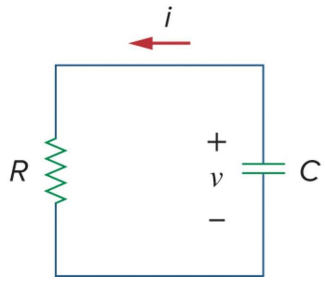
7. In the circuit shown below,

$$v(t) = 56e^{-200t} \;\; V, \;\; t > 0$$
$$i(t) = 8e^{-200t} \;\; mA, \;\; t > 0$$

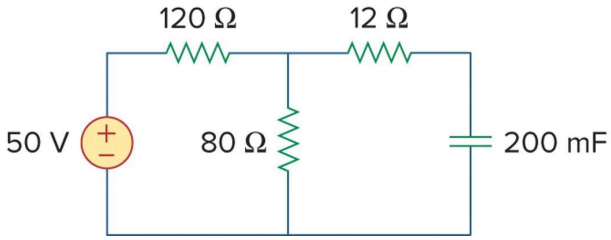
a. Find the values of *R* and *C*

b. Calculate the time constant τ

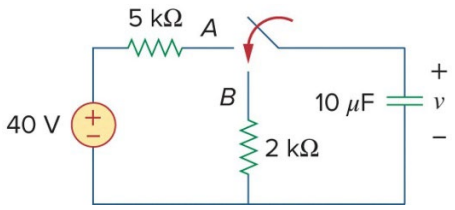
c. Determine the time required for the voltage to decay to half of its original value at *t* = 0.



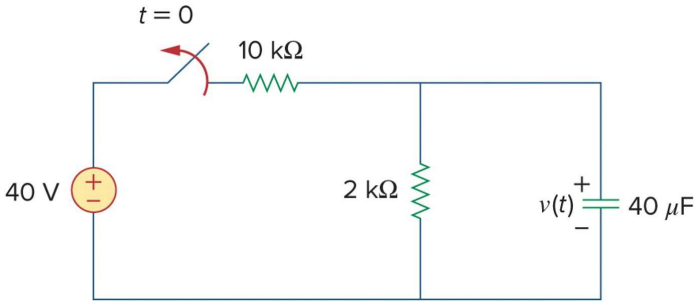
8. Find the time constant for the following RC circuit.



9. The switch in the circuit below has been in position A for a long time. Assume the switch moves instantaneously from A to B at $t = 0$. Find v for $t > 0$.



10. The switch in the following circuit has been closed for a long time, and it opens at t = 0. Find v(t) for t ≥ 0.



11. In the circuit shown below,

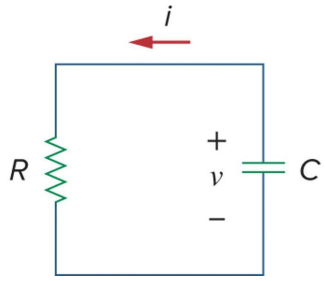
$$v(t) = 10e^{-4t}\ V, \quad t > 0$$
$$i(t) = 0.2e^{-4t}\ A, \quad t > 0$$

a. Find *R* and *C*

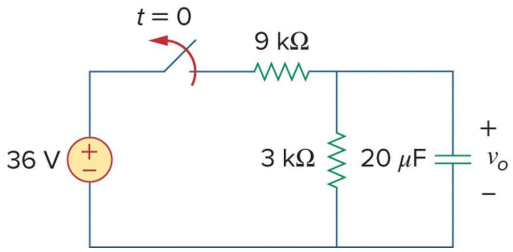
b. Determine the time constant τ

c. Calculate the initial energy in the capacitor

d. Obtain the time it takes to dissipate 50 % of the initial energy

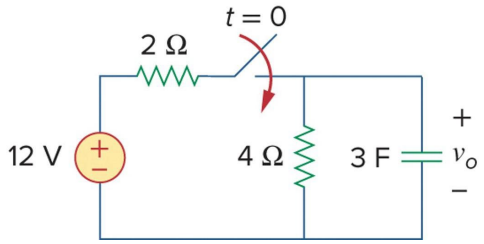


12. For the following circuit, find $v_o(t)$ for $t > 0$. Determine the time necessary for the capacitor voltage to decay to 1/3 of its original value at $t = 0$.

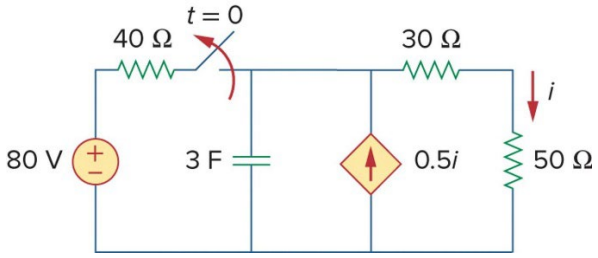


13. (*a*) If the switch in the circuit below has been open for a long time and is closed at $t = 0$. Find $v_o(t)$.

    (*b*) Suppose the switch has been closed for a long time and is opened at $t = 0$. Find $v_o(t)$.



14. Consider the circuit shown below. Find $i(t)$ for $t < 0$ and $t > 0$.



15. The switch in the following circuit has been in position a for a long time. At $t = 0$, it moves to position b. Calculate $i(t)$ for all $t > 0$.