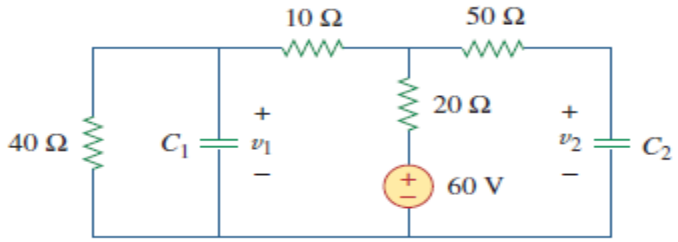
ITSE-1261 Fundamentals of Electrical Circuits worksheet

1. If the voltage across a **5-F** capacitor is $\mathbf{2te^{-3t}\ V}$, find the **current** and the **power**.
2. In **5 s**, the voltage across a **40-mF** capacitor changes from **160 V** to **220 V**. Calculate the average current through the capacitor.
3. At t**=0**, the voltage across a **50-mF** capacitor is **10 V**. Calculate the **voltage** across the capacitor for $t > 0$ when current **4**t **mA** flows through it.
4. A current of **6 sin 4**t **A** flows through a **2-F** capacitor. Find the **voltage** $v(t)$ across the capacitor given that $v(0) = 1$ **V.**
5. A **4-mF** capacitor has the terminal voltage

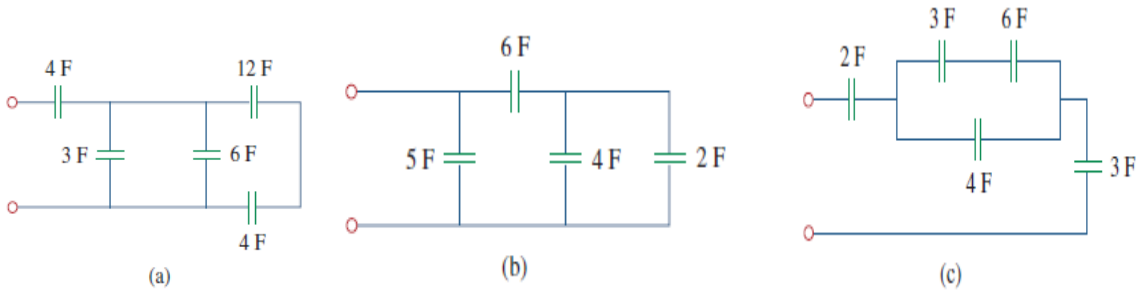
$$v(t) = \begin{cases} 50V, & t \le 0 \\ Ae^{-100t} + Be^{-100t}V, & t \ge 0 \end{cases}$$

If the capacitor has initial current of 2A, find:
(a) The constants A and B,
(b) The energy stored in the capacitor at t = 0,
(c) The capacitor current for t >0.

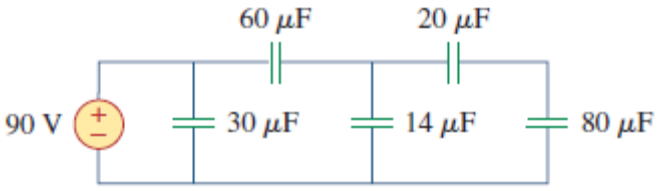
6. Find the voltage across the capacitors in the circuit below under dc conditions.



7. Determine the equivalent capacitance for each of the circuits



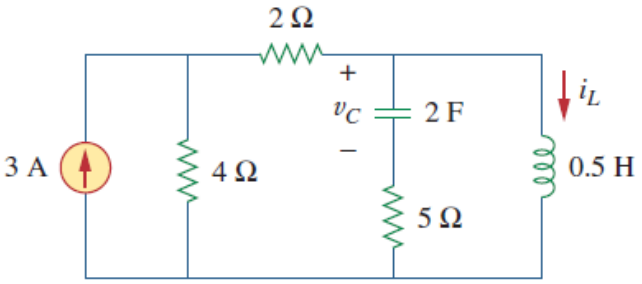
8. For the circuit shown below, determine (a) the voltage across each capacitor and (b) the energy stored in each capacitor.



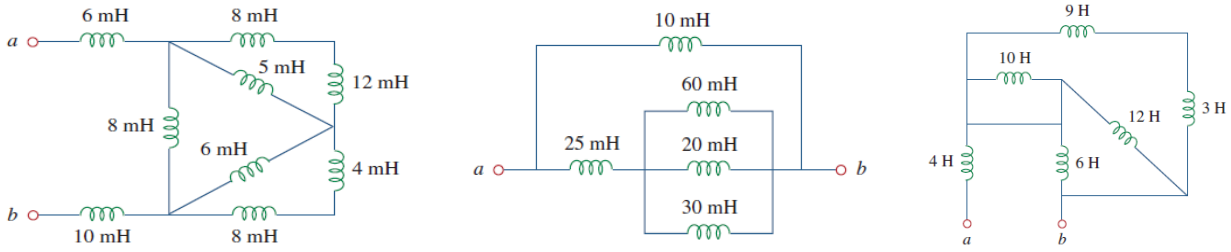
9. Three capacitors, C_1 = **5 μF**, C_2 = **10 μF**, and C_3 = **20 μF**, are connected in parallel across a **150-V** source. Determine:

   (a) The total capacitance,
   (b) The charge on each capacitor,

10. The current through a **10-mH** inductor is $\mathbf{6e^{-t/2}}$ **A**. Find the voltage and the power at t=3S.
11. An inductor has a linear change in current from 50 mA to 100 mA in 2 mS and induces a voltage of 160 mV. Calculate the value of the inductor.
12. The voltage across a **2-H** inductor is $\mathbf{20(1 - e^{-2t})}$ **V**. If the initial current through the inductor is 0.3 A, find the current and the energy stored in the inductor at t = 1 s.
13. A 100-mH inductor is connected in parallel with a **2-kΩ** resistor. The current through the inductor is i(t) =$\mathbf{50\ e^{-400t}}$ **mA**. (a) Find the voltage v_L across the inductor. (b) Find the voltage v_R across the resistor. (c) Calculate the energy in the inductor at t=0.
14. Find v_C, i_L, and the energy stored in the capacitor and inductor in the circuit below under dc conditions.

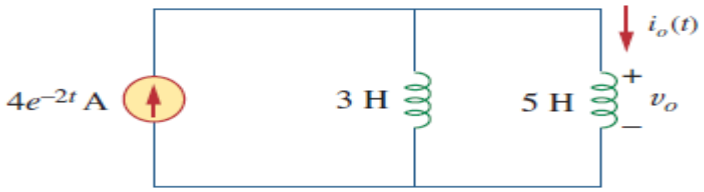


15. Find L_{eq} at the terminals of the circuits given below

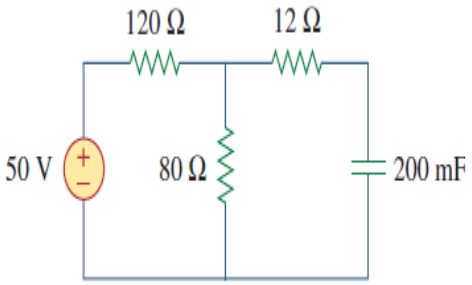


(a) (b) (c)

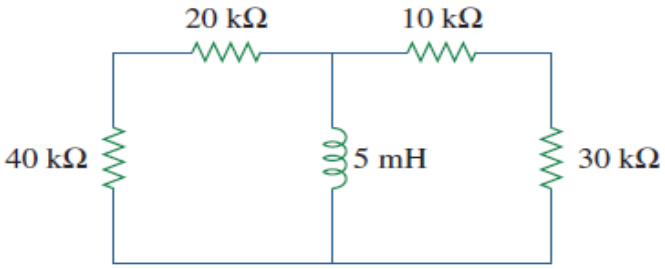
16. In the circuit below, $i_o(0)$ = 2 A. Determine $i_o(t)$ and $v_o(t)$ for $t > 0$.



17. Determine the time constant for the circuits given below

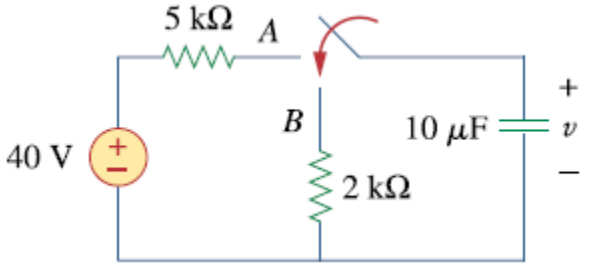


(a)

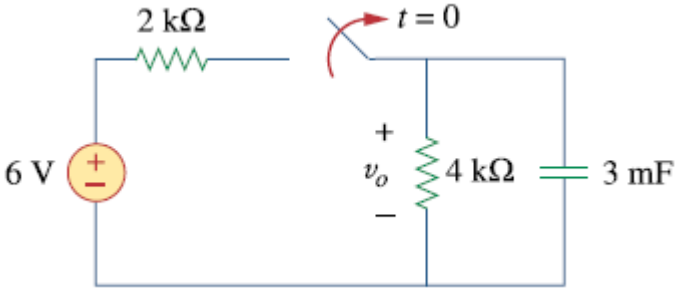


(b)

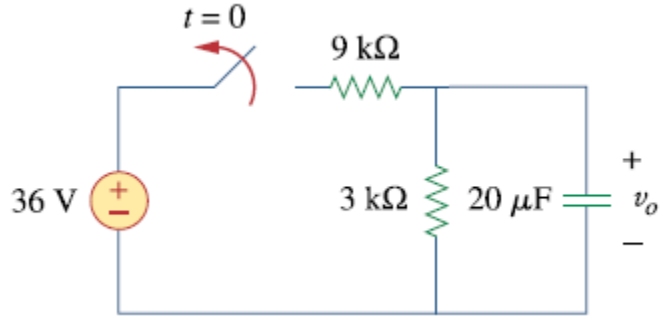
18. The switch in the circuit below moves instantaneously from A to B at $t = 0$. Find v for $t > 0$.



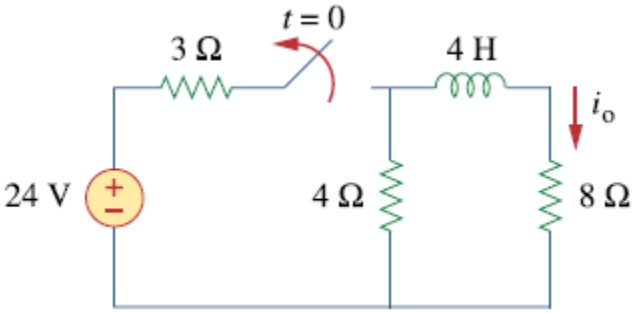
19. The switch in the circuit below opens at $t = 0$. Find V_0 for $t > 0$



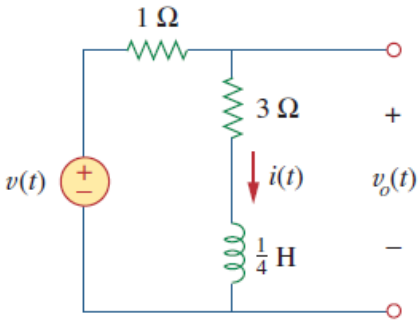
20. For the circuit depicted below, find $v_0(t)$ for $t > 0$. Determine the time necessary for the capacitor voltage to decay to one-third of its value at $t = 0$.



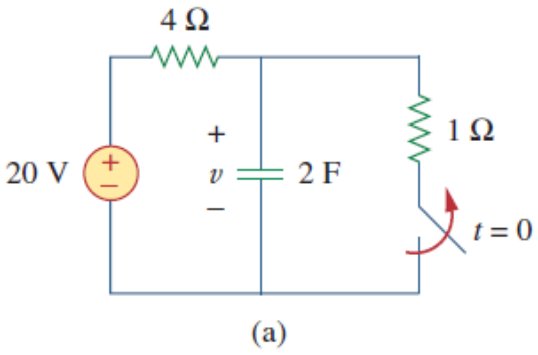
21. For the circuit given below, find i_0 for $t > 0$.



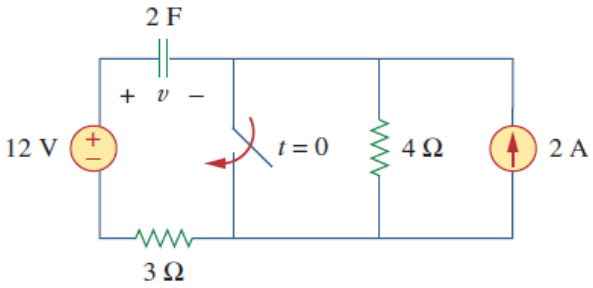
22. Given the circuit below, Find $v_0(t)$ if $i(0) = 2$ A and $v(t) = 0$.



23. Calculate the capacitor voltage for $t < 0$ and $t > 0$ for each of the circuits depicted below.

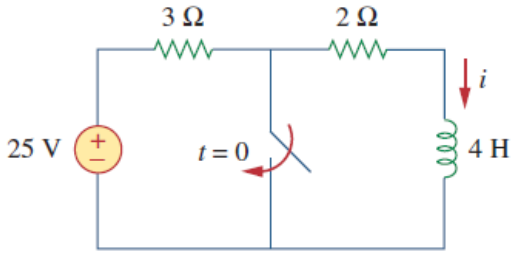


(a)

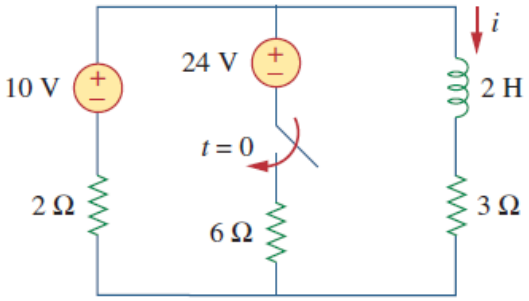


(b)

24. Determine the inductor current $i(t)$ for both $t < 0$ and $t > 0$ for each of the circuits:

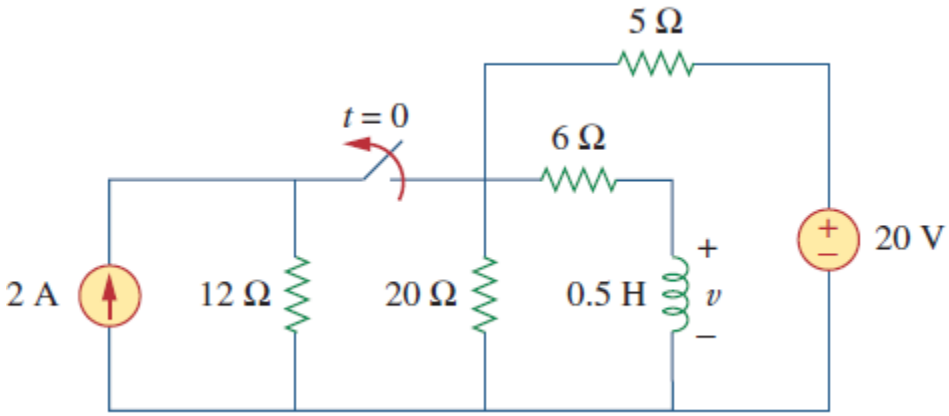


(a)



(b)

25. For the network shown, find $v(t)$ for $t > 0$.



26. Determine the step response v_0 (t) to v_s in the circuit below