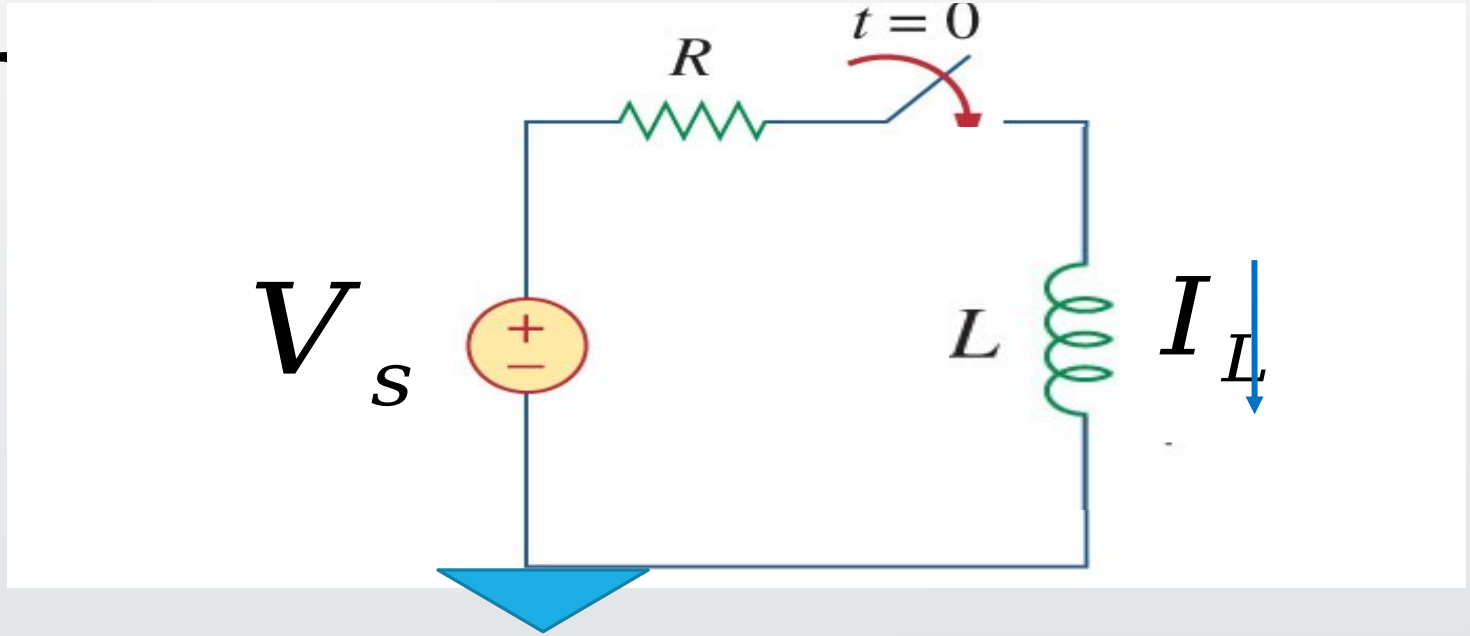
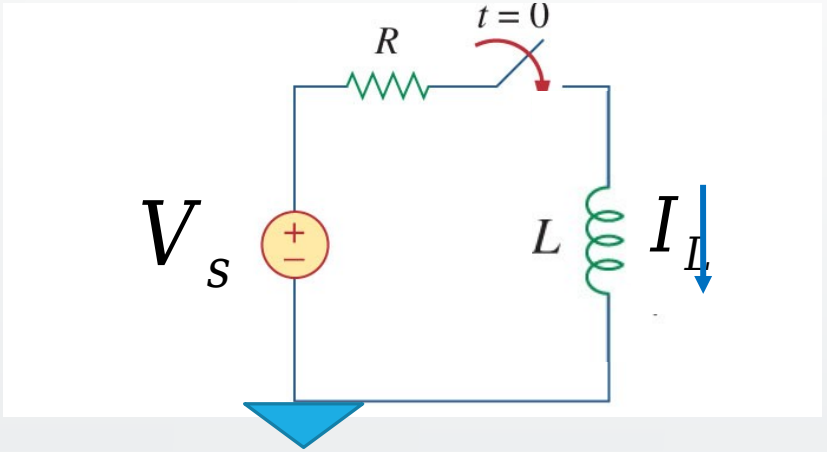
Circuitos de pr
RL



Circuito RL



$$V_s = V_L + R \cdot I_L \qquad V_L = L\frac{di_L}{dt}$$

$$V_s = L\frac{di_L}{dt} + R\,I_L$$

$$\frac{V_s}{R} = \frac{L}{R}\frac{di_L}{dt} + I_L \qquad I_L(\infty) = \frac{V_s}{R} = I_f$$

$$I_f = \frac{L}{R}\frac{di_L}{dt} + I_L \qquad I_L(0) = I_{Ic}$$

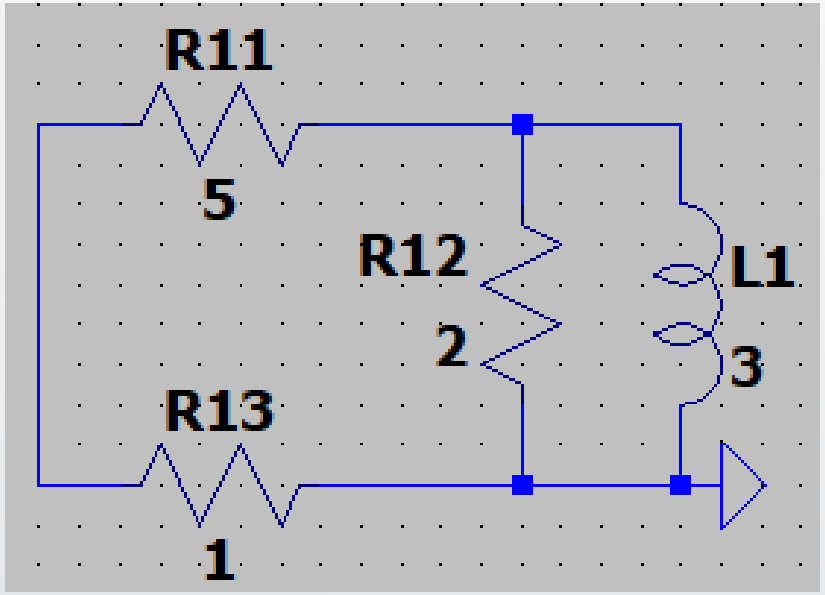
Solucionando la ecuación diferencial de primer orden

$$I_L(t) = (I_{Ic} - I_f)\,e^{\frac{-tR}{L}} + I_f \qquad \tau = \frac{L}{R}$$

Donde:
: Corriente sobre la inductancia
Corriente inicial sobre el inductor
: Corriente final sobre el inductor
L: Inductancia
R: Resistencia equivalente que carga el inductor

Ejemplo 1

Calcule el si la inductancia tiene una corriente inicial de 500 mA



$$I_L(t)=(I_{Ic}-I_f)e^{\frac{-t}{\tau}}+I_f$$

$$R=\frac{6\cdot 2}{8}=1.5\ \Omega$$

$$I_{IC}=500\,mA$$

$$I_f=0\,mA$$

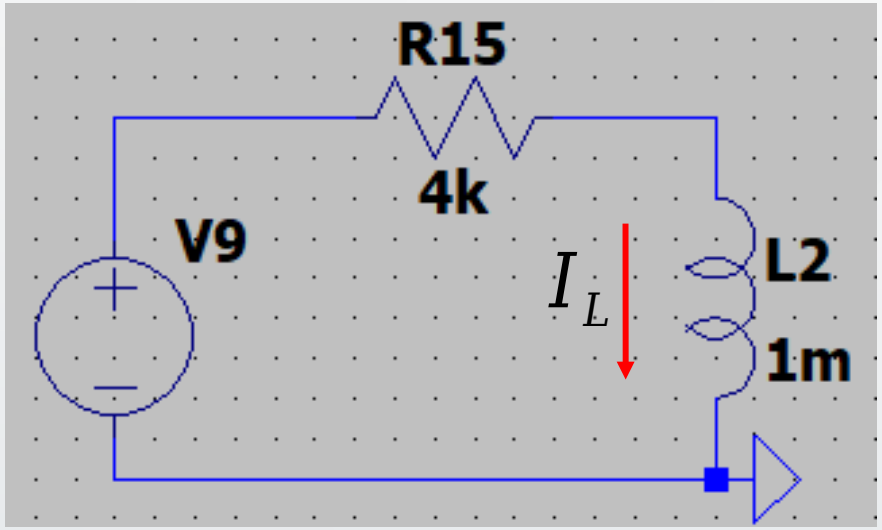
$$\tau=\frac{3}{1.5}=2s$$

R/ $$I_L(t)=(0.5-0)e^{\frac{-t}{2}}+0$$

$$V_L=L\frac{di_L}{dt} \qquad V_L(t)=-0.75e^{\frac{-t}{2}}$$

Ejemplo 2

Calcule el si el inductor tiene una corriente inicial de 1 A y



$$I_L(t)=(I_{Ic}-I_f)e^{\frac{-t}{\tau}}+I_f$$

$$I_{IC}=1\,A$$

$$I_f=\frac{-3k-0}{4k}=-0.75\,A$$

$$\tau=\frac{1m}{4k}=250\,ns$$

R/ $$I_L(t)=(1-(-0.750))e^{\frac{-t}{250\,n}}-0.75$$

Ejemplo 3

At $t = 0$, switch 1 in Fig. 7.53 is closed, and switch 2 is closed 4 s later. Find $i(t)$ for $t > 0$. Calculate i for $t = 2$ s and $t = 5$ s.

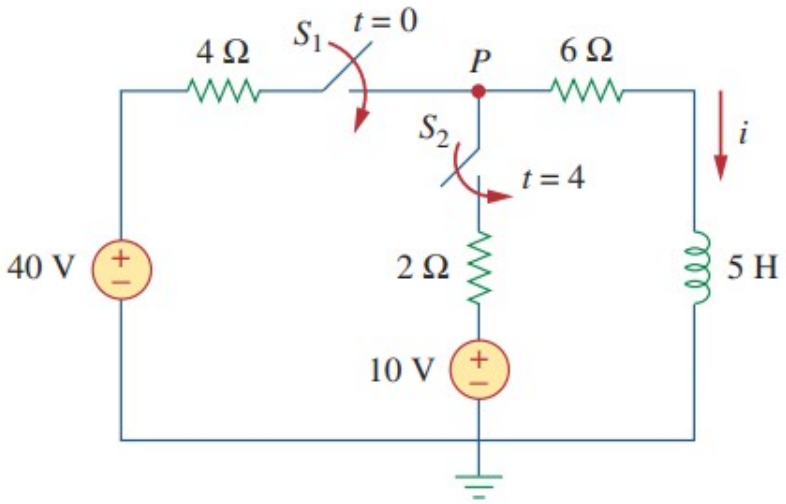


Figure 7.53
For Example 7.13.

R/
-4*exp(-2*time)+4
1.263*exp(-1.467*(time-4)*u(time-4))+30/11

Ejercicios

7.11 For the circuit in Fig. 7.91, find i_o for $t > 0$.

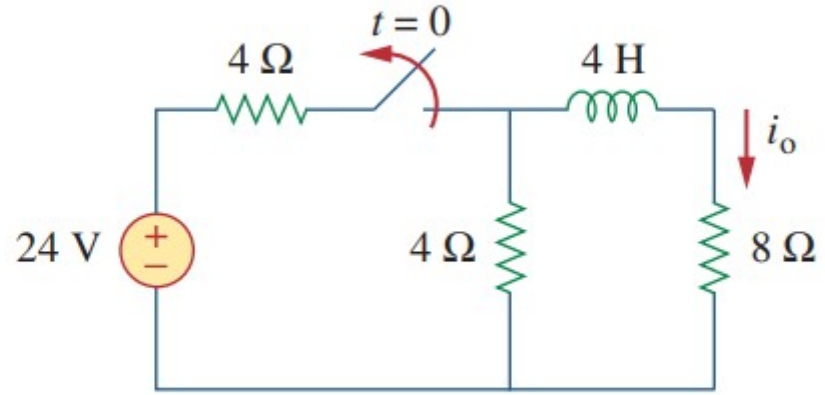


Figure 7.91
For Prob. 7.11.

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7.19 In the circuit of Fig. 7.99, find $i(t)$ for $t > 0$ if $i(0) = 6$ A.

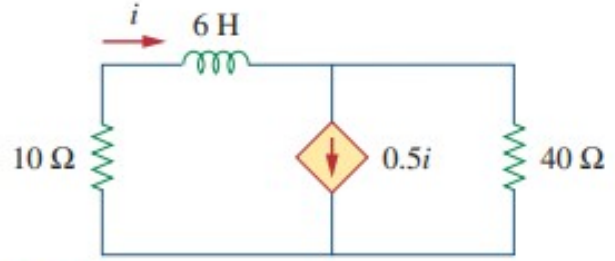

Figure 7.99
For Prob. 7.19.

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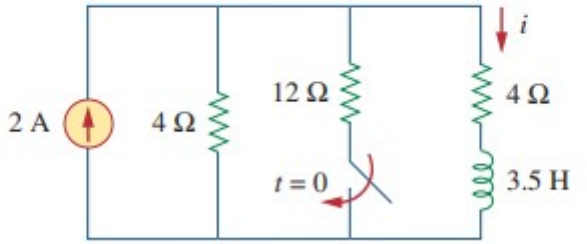
7.54 Obtain the inductor current for both $t < 0$ and $t > 0$ in each of the circuits in Fig. 7.120.



(a)

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