7

5.56

✓ **Answer**

$i(0) = -10\ mA$ as it is short circuited.

$i(\infty) = 20\ mA$ as it is short circuited.

$i(t) = 20 - 30e^{-500t}$

6.24

✓ **Answer**

$v_c(0) = 0.2\ mV$

$v_c(\infty) = 0.4\ mV$

$i_c(0) = 0$

$\alpha = \frac{R}{2L} = 6.2$

$\omega_0 = \frac{1}{\sqrt{LC}} = 6$

$\alpha > \omega_0$

$s_1 = -4.638$

$s_2 = -7.762$

$A_1 = -0.497$

$A_2 = 0.297$

$v_c(t) = -0.497e^{-4.638t} + 0.297e^{-7.762t} + 0.4\ mV$

$i_c(t) = 2.305e^{-4.638t} - 2.305e^{-7.762t}$

$i_c(t) = 1.280(e^{-4.638t} - e^{-7.762t})$

6.33

✓ **Answer**

After source transforms, the circuit may be reduced to a single loop containing:

- 1Ω resistor
- $\begin{cases} -1.5 & t < 0 \\ 2.5 & t > 0 \end{cases} V$ battery
- $8\ mF$ capacitor

- $2\ mH$ inductor

$\alpha = \frac{R}{2L} = 250$
$\omega_0 = \frac{1}{\sqrt{LC}} = 250$
$\omega_0 = \alpha$

$B_1 = -4$
$B_2 = -1000$

$v_c(t) = -(4 + 1000t)e^{-250t} + 2.5\ V$

6.43

✓ **Answer**

Simplified parallel circuit before $t = 0$:

- $2.5\ A$ current source
- $\frac{4}{3}\ \Omega$ resistor
- $1\ mH$ inductor
- $1\ mF$ capacitor

$i_l(0) = 2.5\ A$

Simplified parallel circuit after $t = 0$

- $2\ A$ current source
- $\frac{10}{17}\ \Omega$ resistor
- $1\ mH$ inductor
- $1\ mF$ capacitor

$i_l(\infty) = 2\ A$

$\alpha = \frac{1}{2RC} = 850$
$\omega_0 = \frac{1}{\sqrt{LC}} = 1000$

$D_1 = 0.5$
$D_2 = 0.807$

$\omega_d = 526.783$

$i_l(t) = e^{-850t}(0.5\cos(526.783t) + 0.807\sin(526.783t)) + 2\ A$

7.27

a

✓ **Answer**

$Re = 6.150$

$Im = 10.243$

$11.947\cos(6t + 59.019)$

b

✓ **Answer**

$Re = 5.224$

$Im = 1.699$

$5.493\sin(1000t + 71.983)$

c

✓ **Answer**

$Re = 0$

$Im = -3.464$

$-3.464\sin(377t)$

d

✓ **Answer**

$Re = 10$

$Im = 10$

$14.142\sin(800t + 45)$