Benha University | Electrical Circuits (2) | Electrical Eng. Dept.
Faculty of Engineering | | 1st year communication
Shoubra | | 3-5 May 2015

Sheet (9)... AC and DC transient (Laplace)

1. In the series RC circuit of Fig. 1, the capacitor has an initial charge q= 2500 x 10^{-6}coulomb. At t = 0, the switch is closed and a constant voltage source V = 100 volts is applied to the circuit. Use Laplace transform method to find the current.

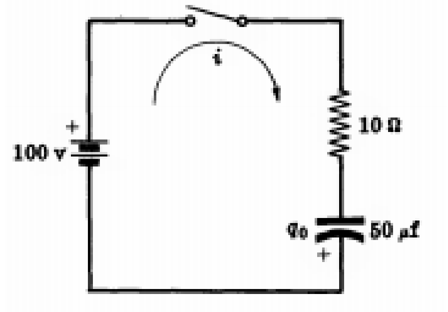

Figure 1

2. In the RL circuit shown in Fig. 2 below, the switch is in position 1 long enough to establish steady state conditions and at t = is switched to position 2. Find the resulting current.

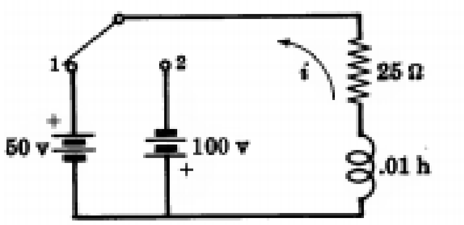

Figure 2

3. In the series RL circuit of Fig. 3 an exponential voltage v= $50e^{-100t}$ is applied by closing the switch at t = 0. Find the resulting current.

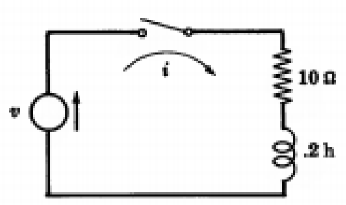

Figure 3

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4. The series RC circuit of Fig. 4 has a sinusoidal voltage source v = 180 sin (2000t + Ø) and an initial charge on the capacitor q= 1250 x10^{-6} coulomb with polarity as shown. Determine the current if the switch is closed at a time corresponding to Ø= 90°.

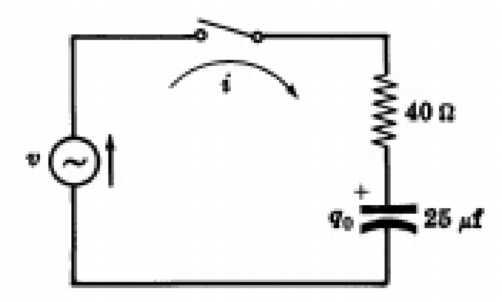

Figure 4

5. In the series RL circuit of Fig. 5 the sinusoidal source is given by v = 100 sin (500t + Ø). Determine the resulting current if the switch is closed when Ø = 0.

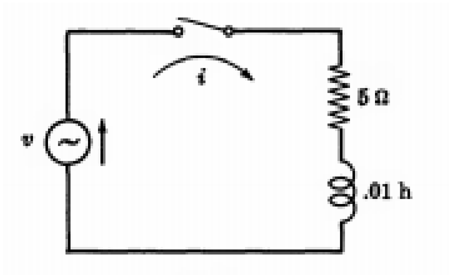

Figure 5

6. In the series RLC circuit shown in Fig. 6, there is no initial charge on the capacitor. If the switch is closed at t = 0, determine the resulting current.

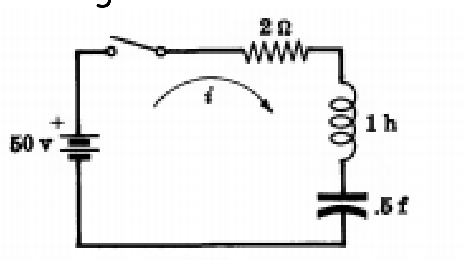

Figure 6

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7. In the two mesh network of Fig. 7, find the currents which result when the switch is closed.

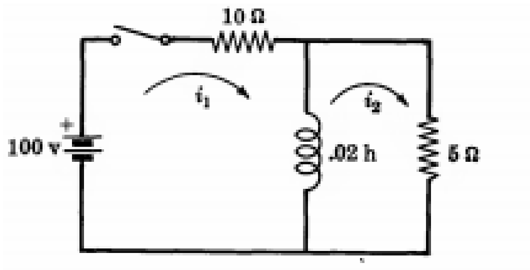

Figure 7

8. In the two-mesh network shown in Fig. 8 there is no initial charge on the capacitor. Find the mesh currents i1 and i2 which result when the switch is closed at t = 0.

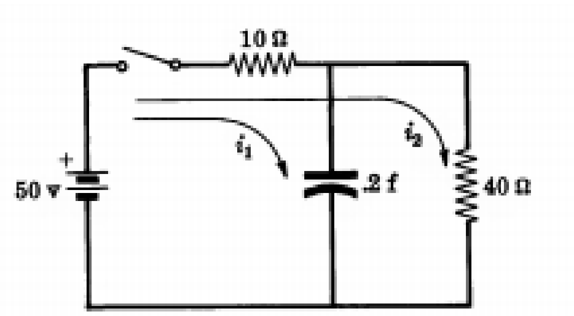

Figure 8

Good Luck

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LAPLACE TRANSFORMS

	$f(t)$	$\mathbf{F}(s)$
1.	$A \qquad t \geq 0$	$\frac{A}{s}$
2.	$At \qquad t \geq 0$	$\frac{A}{s^2}$
3.	e^{-at}	$\frac{1}{s+a}$
4.	te^{-at}	$\frac{1}{(s+a)^2}$
5.	$\sin \omega t$	$\frac{\omega}{s^2+\omega^2}$
6.	$\cos \omega t$	$\frac{s}{s^2+\omega^2}$
7.	$\sin(\omega t+\theta)$	$\frac{s \sin\theta + \omega\cos\theta}{s^2+\omega^2}$
8.	$\cos(\omega t+\theta)$	$\frac{s \cos\theta - \omega\sin\theta}{s^2+\omega^2}$
9.	$e^{-at}\sin\omega t$	$\frac{\omega}{(s+a)^2+\omega^2}$
10.	$e^{-at}\cos\omega t$	$\frac{(s+a)}{(s+a)^2+\omega^2}$
11.	$\sinh \omega t$	$\frac{\omega}{s^2-\omega^2}$
12.	$\cosh \omega t$	$\frac{s}{s^2-\omega^2}$
13.	df/dt	$s\mathbf{F}(s) - f(0+)$
14.	$\int f(t)\,dt$	$\frac{\mathbf{F}(s)}{s} + \frac{f^{-1}(0+)}{s}$
15.	$f(t-t_1)$	$e^{-t_1 s}\mathbf{F}(s)$
16.	$f_1(t)+f_2(t)$	$\mathbf{F}_1(s)+\mathbf{F}_2(s)$

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