Ch32 (Homework)
Current Score : – / 27 **Due :** Monday, August 27 2018 02:30 PM CDT

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1. –/2 pointsSerPSE9 32.P.004.MI.FB.

A solenoid of radius 1.70 cm has 440 turns and a length of 25.0 cm.

(a) Find its inductance.
[ ] mH

(b) Find the rate at which current must change through it to produce an emf of 70.0 mV. (Enter the magnitude.)
[ ] A/s

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2. –/4 pointsSerPSE9 32.P.006.

A 36.5 mA current is carried by a uniformly wound air-core solenoid with 400 turns, a 16.5 mm diameter, and 11.5 cm length.

(a) Compute the magnetic field inside the solenoid.
[ ] μT

(b) Compute the magnetic flux through each turn.
[ ] $T \cdot m^2$

(c) Compute the inductance of the solenoid.
[ ] mH

(d) Which of these quantities depends on the current? (Select all that apply.)
- ☐ magnetic field inside the solenoid
- ☐ magnetic flux through each turn
- ☐ inductance of the solenoid

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3. –/3 pointsSerPSE9 32.P.009.WI.

The current in a 70.0-mH inductor changes with time as $i = 3.00t^2 - 7.00t$, where i is in amperes and t is in seconds.

(a) Find the magnitude of the induced emf at $t = 1.00$ s.

[ ] mV

(b) Find the magnitude of the induced emf at $t = 4.00$ s.

[ ] mV

(c) At what time is the emf zero?

[ ] s

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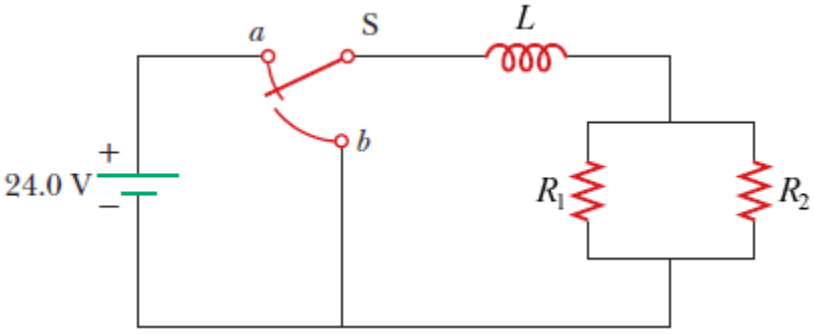
4. –/2 pointsSerPSE9 32.P.019.

Consider the circuit shown in the figure below where $L = 4.65$ mH and $R_2 = 445\ \Omega$.



(a) When the switch is in position a, for what value of R_1 will the circuit have a time constant of 14.9 μs?

[ ] kΩ

(b) What is the current in the inductor at the instant the switch is thrown to position b?

[ ] mA

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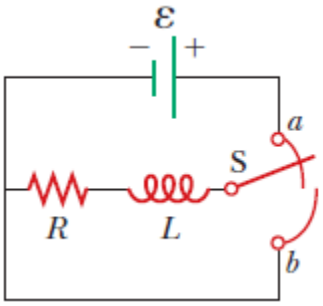
5. –/3 pointsSerPSE9 32.P.031.MI.

A 140-mH inductor and a 5.20-Ω resistor are connected with a switch to a 6.00-V battery as shown in the figure below.



(a) After the switch is first thrown to *a* (connecting the battery), what time interval elapses before the current reaches 220 mA?

[ ] ms

(b) What is the current in the inductor 10.0 s after the switch is closed?

[ ] A

(c) Now the switch is quickly thrown from *a* to *b*. What time interval elapses before the current in the inductor falls to 160 mA?

[ ] ms

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6. –/2 pointsSerPSE9 32.P.035.

On a clear day at a certain location, a 147-V/m vertical electric field exists near the Earth's surface. At the same place, the Earth's magnetic field has a magnitude of 4.500×10^{-5} T.

(a) Compute the energy density of the electric field.

[ ] nJ/m^3

(b) Compute the energy density of the magnetic field.

[ ] $\mu J/m^3$

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7. –/2 pointsSerPSE9 32.P.039.

The magnetic field inside a superconducting solenoid is 4.90 T. The solenoid has an inner diameter of 6.20 cm and a length of 26.0 cm.

(a) Determine the magnetic energy density in the field.

u_B = [ ] J/m^3

(b) Determine the energy stored in the magnetic field within the solenoid.

U_B = [ ] kJ

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8. –/1 pointsSerPSE9 32.P.041.

Two coils, held in fixed positions, have a mutual inductance of 130 μH. What is the peak emf in one coil when the current in the other coil is $i(t) = 15.0 \sin(1.25 \times 10^3 t)$, where i is in amperes and t is in seconds?

[ ] V

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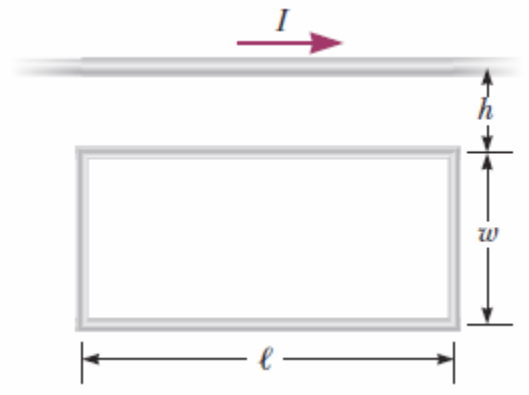
9. –/1 pointsSerPSE9 32.P.045.

On a printed circuit board, a relatively long, straight conductor and a conducting rectangular loop lie in the same plane as shown in the figure below. Taking h = 0.400 mm, w = 1.10 mm, and ℓ = 2.70 mm, find their mutual inductance.

[ ] pH



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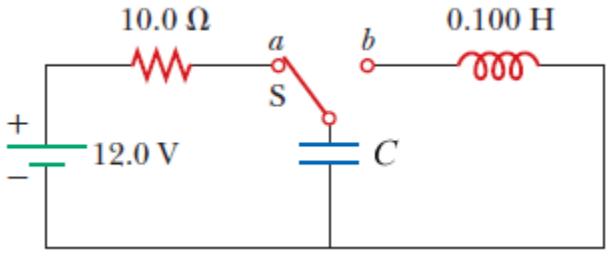
10. –/4 pointsSerPSE9 32.P.053.WI.

The switch in the figure below is connected to position *a* for a long time interval. At $t = 0$, the switch is thrown to position *b*. After this time, what are the following? (Let $C = 1.10$ μF.)



(a) the frequency of oscillation of the *LC* circuit

[ ] Hz

(b) the maximum charge that appears on the capacitor

[ ] μC

(c) the maximum current in the inductor

[ ] mA

(d) the total energy the circuit possesses at $t = 3.00$ s

[ ] μJ

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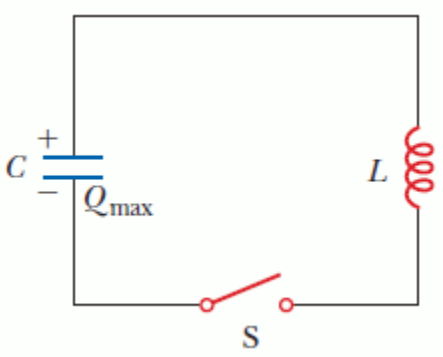
11. –/3 pointsSerPSE9 32.P.054.

An *LC* circuit like that in the figure below consists of a 3.30-H inductor and an 838-pF capacitor that initially carries a 128-μC charge. The switch is open for $t < 0$ and is then thrown closed at $t = 0$. Compute the following quantities at $t = 4.00$ ms.



(a) the energy stored in the capacitor

[ ] J

(b) the total energy in the circuit

[ ] J

(c) the energy stored in the inductor

[ ] J

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