1. 5 V_{pk} is equivalent to:
   a. 7.07 $V_{pk\text{-}pk}$
   b. 10 $V_{pk\text{-}pk}$
   c. 2.5 $V_{pk\text{-}pk}$
   d. 25 $V_{pk\text{-}pk}$

2. 20 V_{pk} is equivalent to:
   a. 14.14 V_{rms}
   b. 28.28 V_{rms}
   c. 10 V_{rms}
   d. 40 V_{rms}

3. $V(t) = 5*\sin(377t + 30°)$
   What is the peak value of V(t)?
   a. 3.53 V_{pk}
   b. 2.5 V_{pk}
   c. 5 V_{pk}
   d. 7.07 V_{pk}

4. At 1 kHz, a 10 μF capacitor has a reactance of:
   a. 6.28 mΩ
   b. 15.9 Ω
   c. 159 kΩ
   d. 159 Ω

5. At 60 Hz, a 22 mH inductor has a reactance of:
   a. 8.3 Ω
   b. 8.3 kΩ
   c. 1.32 Ω
   d. 121 mΩ

6. See the phasor diagram to the righ
What component(s) compose Z_T?
a. Resistor
b. Inductor
c. Capacitor
d. Resistor and Inductor
e. Resistor and Capacitor
f. Inductor and Capacitor

7. As frequency increases, the reactance of a capacitor will:
a. Decrease
b. Increase
c. Remain the same
d. It depends on other factors within the circuit

8. At DC, an ideal inductor looks like:
a. A resistor
b. A capacitor
c. An open circuit
d. A short circuit

For questions 9 thru 16, express your answer in both rectangular and polar form.
Read these questions carefully!

9. $(6 \angle 40^\circ) + (8 - 2j) =$ **$(12.73 \angle 8.39^\circ) = (12.6 + 1.86j)$**

10. $(8 \angle 10^\circ) - (7 \angle -10^\circ) =$ **$(2.785 \angle 69.3^\circ) = (0.985 + 2.605j)$**

11. $(5 - 8j) * (5 \angle 8^\circ) =$ **$(47.17 \angle -50.0^\circ) = (30.32 - 36.13j)$**

12. $[\, (-10 + j) + (4 \angle 33^\circ) \,] \;/\; (-8 \angle 72^\circ) =$ **$(0.921 \angle -97.6^\circ) = (-0.121 - 0.913j)$**

13. $[\, (-41 \angle -98^\circ) - (83 - 74j) \,] * [\, (96 \angle 53^\circ) - (64 \angle -84^\circ) \,] =$ **$(20.6k \angle -166^\circ) =$ $(-20k - 5kj)$**

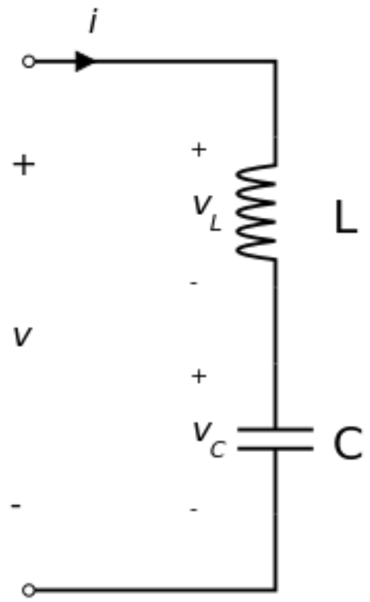
14. $$\frac{[\, (-93 - 66j) + 10j + (37j + 51) \,]}{[\, (75 \angle -37^\circ) - (-47 \angle -5^\circ) - (15 \angle 4^\circ) \,]} = \mathbf{(0.441 \angle -127^\circ) = (-0.265 - 0.352j)}$$

15. $$\frac{[\, (-65 \angle 7^r) + (-78 + 13j) + (42 \angle -21^\circ) \,] * [\, (-5j + 94) * (-8 + 29j) \,]}{[\, (14 \angle -82^\circ) + (94 \angle -55^\circ) - (-23j + 86) \,]} =$$

$(3.758k \angle 63.3^\circ) = (1.687k +$ $3.358kj)$

16. $$\frac{[\, (67 + 56j) * (-15 - 72j) \,] + [\, (-83 * -55j) - (-69 \angle 80^\circ) - (-50 + 77j) \,]^2}{[\, (10 \angle 27^\circ) + (-52 + 77j) - (92 \angle -51^\circ) \,]^3} =$$

$(3.367 \angle 168^\circ) = (-3.296 +$ $0.689j)$



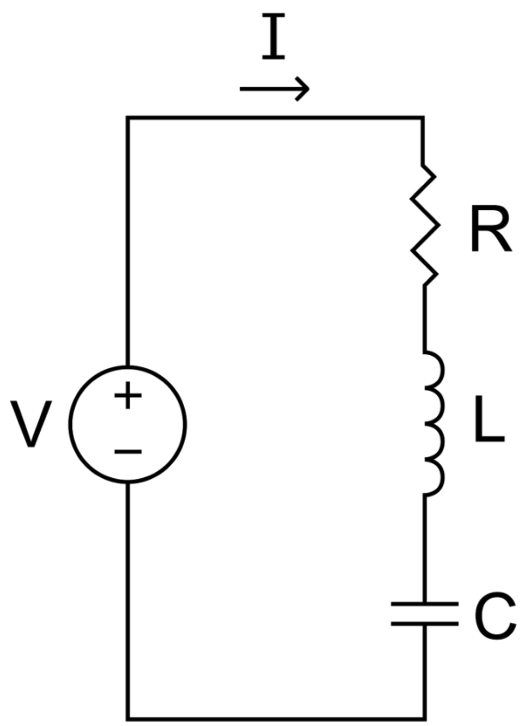
f = 15 kHz
L = 220 μH
C = 470 nF

Questions 17 thru 19 are based on the circuit above.

17. What is the total impedance of the series circuit?
    a. (30.68 ∠ -48°) Ω
    b. (20.73 ∠ 90°) Ω
    c. (22.58 ∠ -90°) Ω
    d. (1.841 ∠ -90°) Ω

18. If the applied voltage is (8 ∠ 15°) V, what is the current?
    a. (261 ∠ 63°) mA
    b. (386 ∠ -75°) mA
    c. (354 ∠ 105°) mA
    d. (4.35 ∠ 105°) A

19. What is V_L?
    a. (90.1 ∠ -165°) V **This answer was misprinted in rev A.**
    b. (7.35 ∠ 105°) V
    c. (8.0 ∠ -75°) V
    d. (5.41 ∠ 63°) V

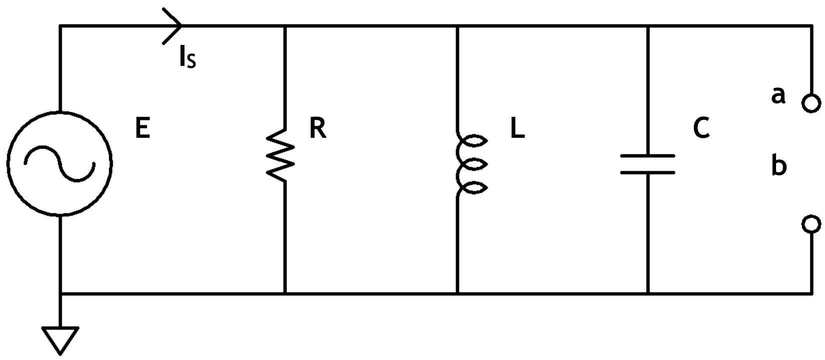


***f* = 480 Hz**
***R* = 470 Ω**
***L* = 220 mH**
***C* = 820 nF**

Questions 20 and 21 are based on the circuit above.

20. What is the total impedance of the circuit?
    a. (620 ∠ -40.7°) Ω
    b. (813 ∠ 54.7°) Ω
    c. (537 ∠ 28.9°) Ω
    d. (259 ∠ 90°) Ω

21. If the applied voltage is (120 ∠ 0°) V, what is the voltage across the resistor?
    a. (876 ∠ -28.9°) mV
    b. (105 ∠ -28.9°) V
    c. (148 ∠ 61.1°) V
    d. (90.4 ∠ -28.9°) V



f = 5 kHz
R = 771 Ω
L = 60 μH
C = 663 nF
I_S = (503 ∠ 126°) mA

Questions 22 thru 27 are based on the circuit above.

22. What is the total impedance seen by the source?

(1.962 ∠ 89.9°) = (0.00499 + 1.962j)

was previously found to be (1.814 ∠ 89.9°) = (0.0043 + 1.814j)

23. What is E_S?

(0.987 ∠ -144°) = (-0.8 - 0.578j)

was previously found to be (0.912 ∠ -144°) = (-0.739 - 0.534j)

24. What is I_C?

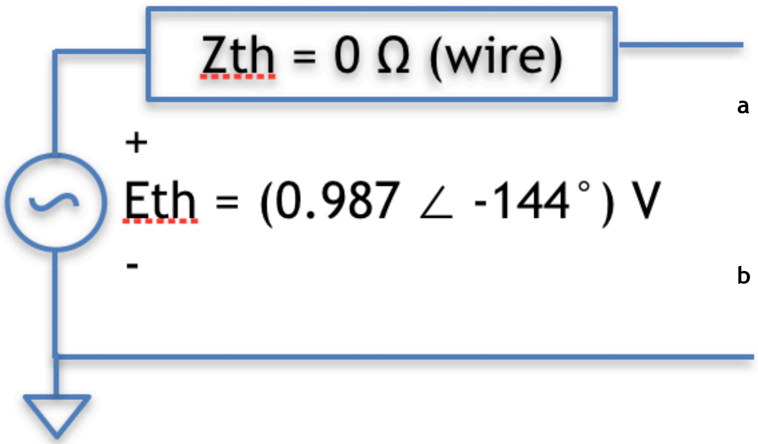
(0.021 ∠ -54.2°) = (0.012 - 0.017j)

was previously found to be (0.019 ∠ -54.1°) = (0.011 - 0.015j)

25. Draw the Thévenin equivalent circuit (voltage source and series impedance).

In an effort to find Zth, we must relax the voltage source. When we do this, we get a short circuit (0 Ω) in parallel with the rest of the components, thus Zth = 0 Ω.

In a parallel circuit, the voltage is the same across all components. This means Eth = Es = (0.987 ∠ -144°) V = (-0.8 - 0.578j) V.



26. What load placed across terminals *a* and *b* would dissipate the most power?

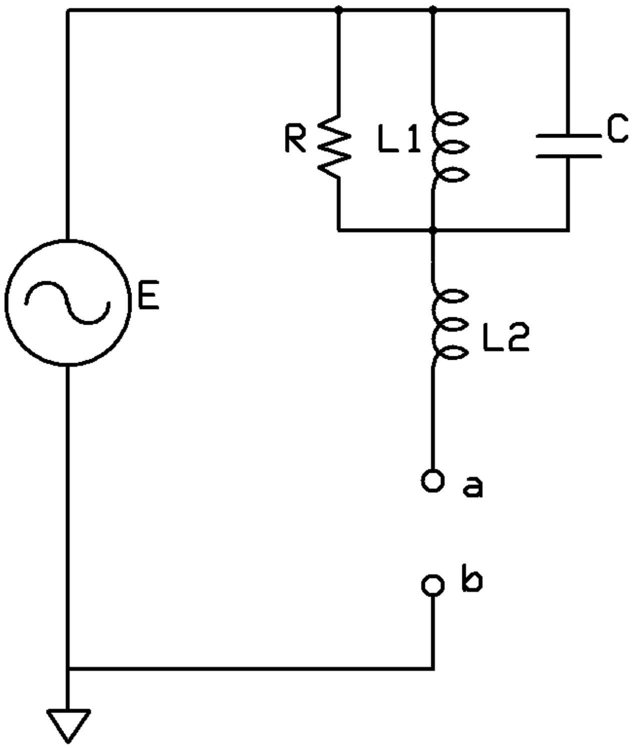
The answer to this question is simply an ideal wire because of the lack of Zth.

This was previously found to be (0.019 ∠ 54.1°) = (0.011 + 0.015j).

27. How much average power would the load you selected in the previous question dissipate?

This is indeterminate.

This was previously found to be **37.8 W.**



f = 100 kHz
R = 50 Ω
L_1 = 3.3 mH
L_2 = 33 mH
C = 100 µF
E = (1 ∠ 0˚) V

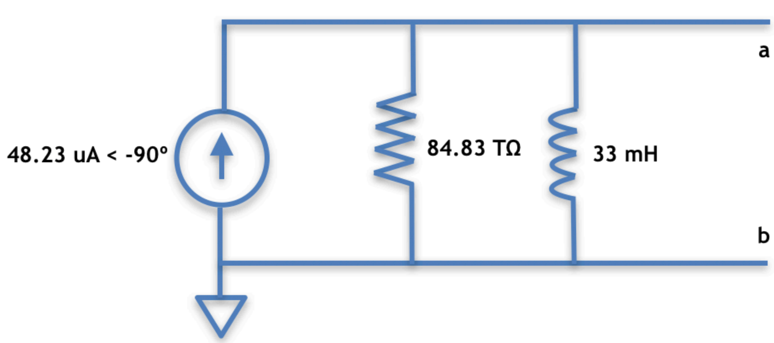
Questions 28 thru 30 are based on the circuit above.

28. What is the Thévenin impedance of the circuit external to points *a* and *b*?

(20.73k ∠ 90˚) = (5.066µ + 20.73kj)

29. Draw the Norton equivalent circuit for 100 kHz (current source with completely parallel components)

Norton current = 48.23 uA < -90º



30. If a 1kΩ resistor is placed across terminals *a* and *b*, how much average power will be dissipated?

    2.321 μW by the 1kOhm

31. Do you want a cookie?
    a. Yes
    b. No
    c. Not sure
    d. Depends on what kind of cookie