ECE 215

Practice problems

1. Convert and plot all of these values on the complex plane
    a. Convert to rectangular:
        i. $10\angle -10^0$

        ii. $5\angle 160^0$

        iii. $7\angle 50^0$

    b. Convert to phasor
        i. - 10 + j6

        ii. 5 - j6

        iii. -17 – j4

2. Perform the requested mathematical operation:
   1. (10+j5)+(-4-j16)

   2. (10+j5)*(-4-j16)

   3. $\frac{12\angle 15^0}{3\angle 27^0}$

   4. $12\angle 150^0 + 6\angle 27^0$

   5. $5\angle 57^0 * 6\angle 36^0$

3. Perform the following computations, preferably by hand. (Use your calculator to check your answers.)
    a. (j6)(j3)

    b. j5 + 5 + j8 + 7

    c. $\frac{j18}{j3}$

    d. (8 + j6)(j8 + 2)

    e. $\frac{1}{8+j5} + \frac{1}{8+j7}$

4. Convert your answers from Problem 3 above to phasor notation
    a.

    b.

    c.

    d.

    e.

5. Convert the following from phasor notation to rectangular coordinates:
   a. $6\angle 30^0$

   b. $2\angle 90^0$

   c. $18\angle 45^0$

   d. $7\angle 54^0$

6. Perform the following calculations:
   a. $(6\angle 30^0)(2\angle 90^0)$

   b. $\frac{2\angle 90^0}{6\angle 30^0}$

   c. $6\angle 30^0 + 2\angle 90^0$

   d. $2\angle 90^0 - 6\angle 30^0$

   e. $\frac{6\angle 30^0}{3\angle 90^0}$

7. Convert the following values into impedances:
    a. C = 10μF, f = 200 Hz

    b. L = 20 mH, f = 20 Hz

    c. R = 15Ω, f = 100 Hz

8. In a given circuit, if $v_s(t) = 100\cos(360^0 1kt)V$, determine the impedances of the following components:
    a. R = 100 Ω

    b. C = 66 μF

    c. L = 10 mH

9. In a given circuit, if $v_s(t) = 100\cos(360^0 500t)V$, determine the impedances of the following components:
    a. R = 150 Ω

    b. C = 270 μF

    c. L = 144 mH

10. Convert the voltage source values to phasor RMS values

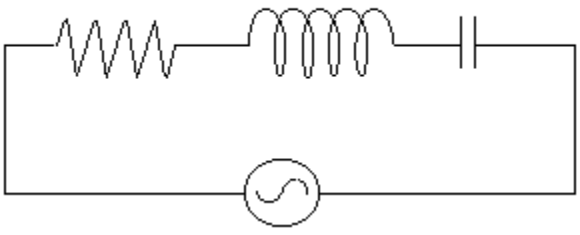
a. $v_s(t) = 5\cos(360° * 100 * t)\, V$

b. $v_s(t) = 377\cos(360° * 60k * t + 30°)\, V$

c. $v_s(t) = 169.73\cos(360° * 400 * t - 45°)\, V$

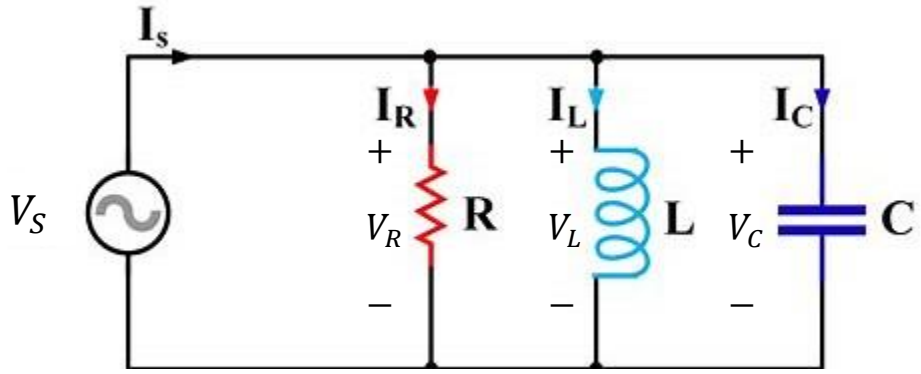
11. For the circuit below, determine the equivalent impedance. Then write a voltage divider equation to determine the voltage drop over the inductor.

Z_r = 4Ω Z_L = j8Ω Z_C = -j11 Ω

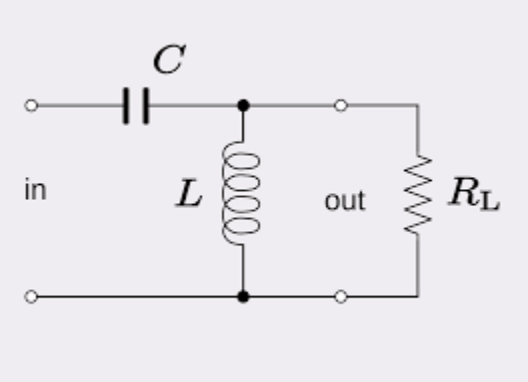


+ $10\angle 0^0$ -

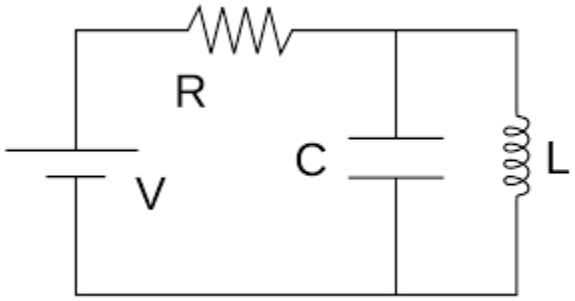
12. The circuit below is operating at 400 Hz. Determine the equivalent impedance. What is the voltage and current drop over each component when $V_S = 150V\angle 0°$, $R = 1k\Omega$, $L = 30\,mH$, and $C = 20\,\mu F$? Also, find I_S without using Z_{eq}



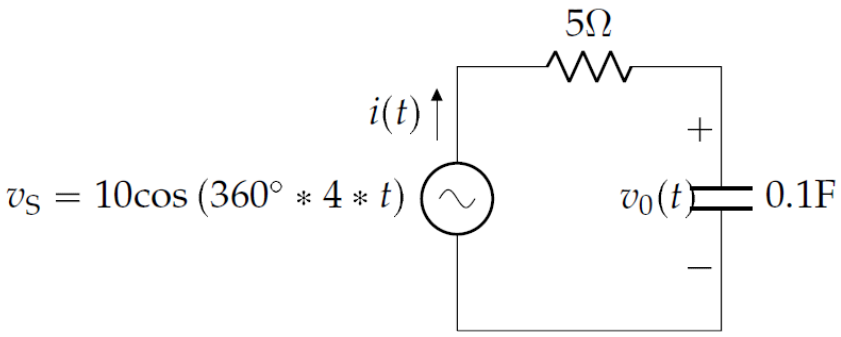
13. For the circuit below, determine the equivalent impedance, given the input frequency is 2kHz, L = 27mH, C = 150nF, and R = 5kΩ



14. For the circuit below, determine the equivalent impedance, given the input frequency is 60Hz, R = 20 Ω, C = 15nF, and L = 2mH. (Assume the voltage source is AC despite the DC source symbol.)



15. For the circuit below, find $v_0(t)$ and $i(t)$



16. For the circuit below, find $\tilde{V}_o$ and the current flowing through the capacitor