

EE 206: Solution to Homework #8

Sinusoidal Source, Complex Numbers, Complex Impedance
Due Monday, March 25th

1) Convert to V_p , V_{pp} , V_{rms}

V_p (peak)	V_{pp} (peak-to-peak)	V_{rms}
10V	20V	7.07V
5V	10V	3.54V
14.14V	28.28V	10V

$$V_{pp} = 2V_p$$

$$V_{rms} = \frac{V_p}{\sqrt{2}}$$

2) Find Y

$$2a) \quad Y = \left(\frac{2+j3}{5+j7} \right) + \left(\frac{10-j3}{8+j5} \right)$$

$$Y = 1.1493 - j0.8179$$

$$2b) \quad Y = \left(\frac{100(s+3)}{s(s+5)(s+10)} \right)_{s=j2}$$

$$y = 0.0332 - j3.2825$$

$$2c) \quad Y = \left(\frac{5s^2+10s+20}{s^3+6s^2+11s+6} \right)_{s=j3}$$

$$Y = 0.5897 - j0.5513$$

3) Express V in phasor form.

3a) $V = 3 \cos(10t) + 7 \sin(10t)$

$$V = 3 - j7$$

3b) $V = 3 \cos(20t - 30^\circ) + 7 \cos(20t + 5^\circ)$

$$V = (3 \angle -30^\circ) + (7 \angle 5^\circ)$$

$$V = 9.5714 - j0.8899$$

3c) $V = 6 \cos(5t - 50^\circ) + 8 \sin(5t)$

$$V = (6 \angle -50^\circ) + (0 - j8)$$

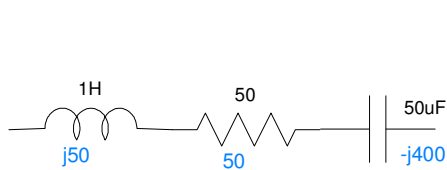
$$V = 3.8567 - j12.5693$$

4) Determine the impedance of the following circuits assuming the frequency is 50 rad/sec

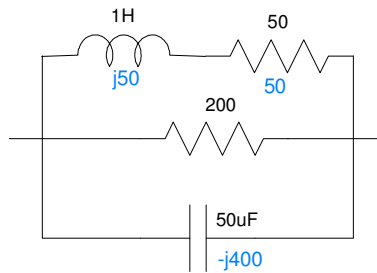
$$R \rightarrow R$$

$$L \rightarrow j\omega L$$

$$C \rightarrow \frac{1}{j\omega C}$$



(a)



(b)



(c)

a) $Z = (j50) + (50) + (-j400)$

$$Z = 50 - j350$$

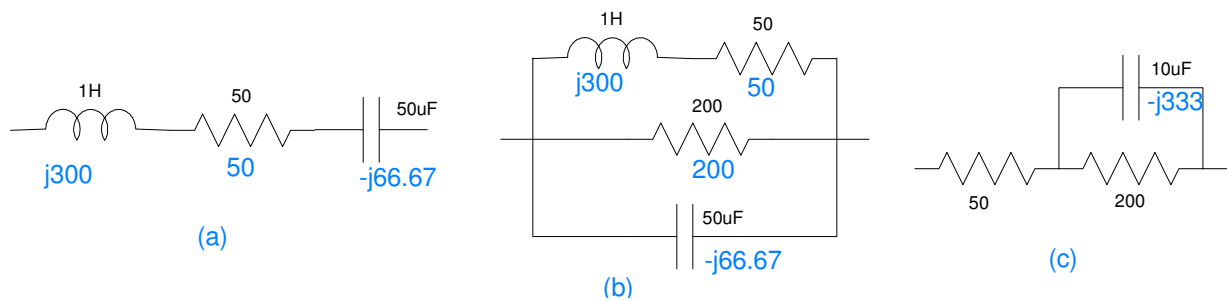
b) $Z = (50 + j50) \parallel (200) \parallel (-j400)$

$$Z = 53.33 + j26.67$$

c) $Z = 50 + (200) \parallel (-j2000)$

$$Z = 248.02 - j19.80$$

5) Determine the impedance of the following circuits assuming the frequency is 300 rad/sec



(a) $Z = (j300) + (50) + (-j66.67)$

$$Z = 50 - j233.33$$

(b) $Z = (50 + j300) \parallel (200) \parallel (-j66.67)$

$$Z = 32.80 - j69.60$$

(c) $Z = 50 + (200 \parallel -j333.33)$

$$Z = 197.06 - j88.24$$