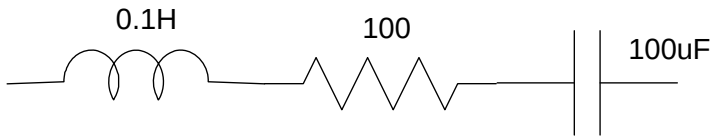
Passive Circuit Elements (RLC)

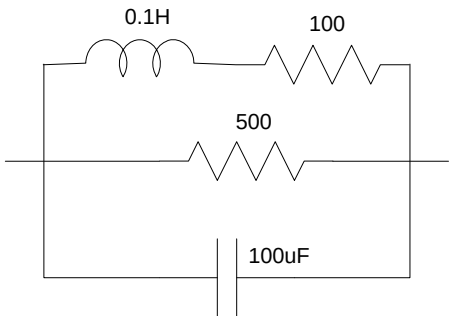
EE 206 Practice Problems

1) Determine the impedance of the following circuit at
   - 10Hz
   - 100Hz
   - 1kHz



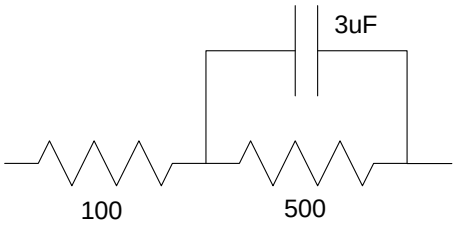
Problem 1

2) Determine the impedance of the following circuit at
   - 10Hz
   - 100Hz
   - 1kHz



Problem 2)

3) Determine the impedance of the following circuit at
   - 10Hz
   - 100Hz
   - 1kHz



Solutions

Note that RLC convert to complex impedances as

$$R \rightarrow R$$

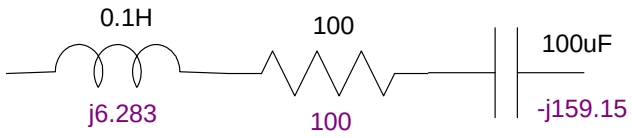
$$L \rightarrow j\omega L = j2\pi fL$$

$$C \rightarrow \frac{1}{j\omega C} = \frac{1}{j2\pi fC}$$

1a) 10Hz

$$Z = (j6.283) + (100) + (-j159.15)$$

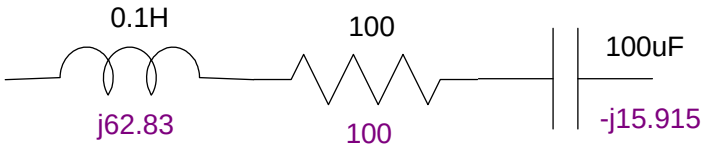
$$Z = 100 - j152.87 \text{ Ohms}$$



1b) 100Hz

$$Z = (j62.83) + (100) + (-j15.915)$$

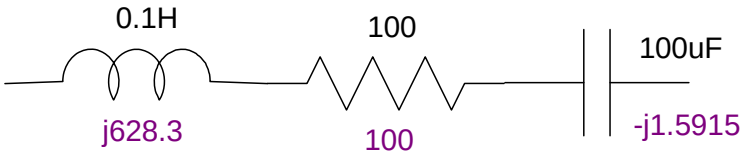
$$Z = 100 + j46.91 \text{ Ohms}$$



1c) 1000Hz

$$Z = (j628.3) + (100) + (-j1.5915)$$

$$Z = 100 + j626.7 \text{ Ohms}$$

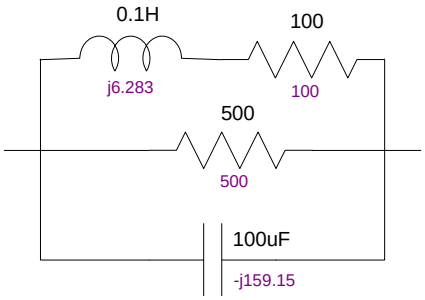


Problem 2)

a) 10Hz

$$Z = (100 + j6.283)||(500)||(-j159.15)$$

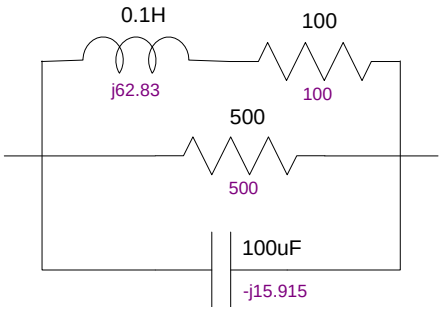
$$Z = 68.321 - j32.317 \text{ Ohms}$$



b) 100Hz

$$Z = (100 + j62.83)||(500)||(-j15.915)$$

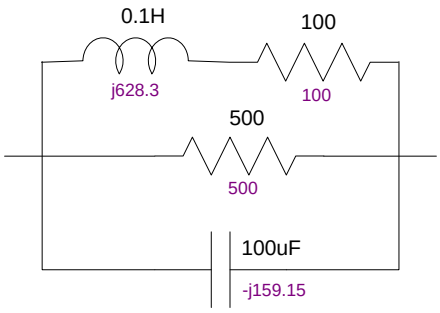
$$Z = 2.630 - j16.731 \text{ Ohms}$$



c) 1000 Hz

$$Z = (100 + j628.3)||(500)||(-j1.5915)$$

$$Z = 0.006 - j1.595 \text{ Ohms}$$

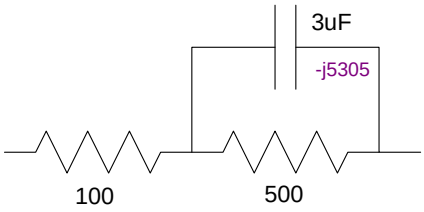


Problem 3)

a) 10Hz

$$Z = 100 + (500 || -j5305)$$

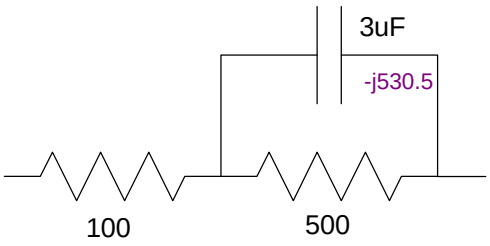
$$Z = 595.6 - j46.7 \text{ Ohms}$$



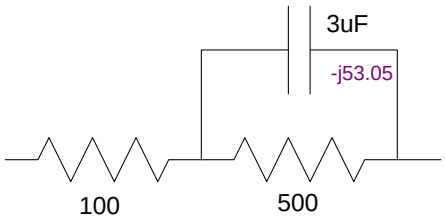
b) 100Hz

$$Z = 100 + (500 || -j530.5)$$

$$Z = 364.8 - j249.5 \text{ Ohms}$$



c) 1000 Hz

$$Z = 100 + (500 || -j53.05)$$

$$Z = 105.5 - j52.5 \text{ Ohms}$$