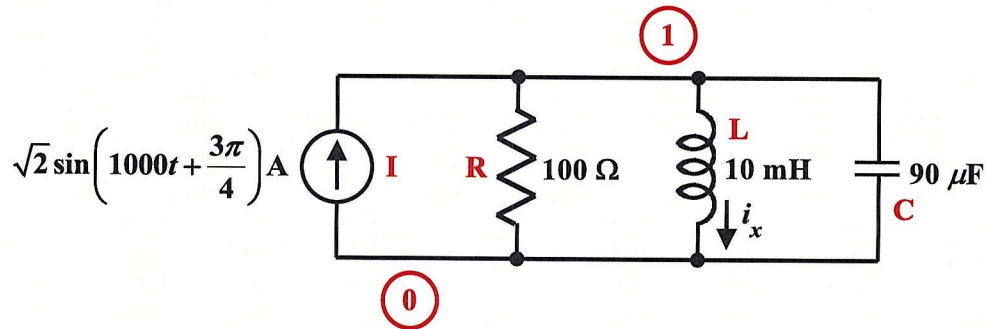


EE 3340  
Homework Problem #012

a. For the circuit shown below:



the following LTspice netlist can be used determine the magnitude and phase angle of the steady-state AC part of  $i_x$ :

```
I 0 1 AC 1.414213562 45
R 1 0 100
L 1 0 10m
C 1 0 90u
.AC LIN 1 159.1549431 159.1549431
```

Run the simulation and identify the desired results in the output file.

*See the attached page.*

b. Use the phasor analysis method to find the analytical solution, and verify that the LTspice result is correct.

$$\begin{aligned}
 I_x &= \frac{\frac{1}{j\omega L}}{\frac{1}{R} + \frac{1}{j\omega L} + j\omega C} & I &= \frac{R I}{j\omega L + R - \omega^2 RLC} \\
 &= \frac{(100)(\sqrt{2} \angle 45^\circ)}{[100 - (1000)^2(100)(0.01)(90 \times 10^{-6})] + j(1000)(0.01)} \\
 &= \frac{100\sqrt{2} \angle 45^\circ}{10 + j10} & &= \frac{100\sqrt{2} \angle 45^\circ}{\sqrt{200} \angle 45^\circ} \\
 &= 10 \angle 0^\circ \text{ A}
 \end{aligned}$$

```
* Q:\Websites\RES\EE 3340\homework problems\Spring 2022 EE 3340 Homework Problem 12.cir
I O 1 AC 1.414213562 45
R 1 0 100
L 1 0 10m
C 1 0 90u
.AC LIN 1 159.1549431 159.1549431
.end
```

--- AC Analysis ---

frequency:	159.155	Hz		
V(1):	mag: 99.95	phase: 89.9714°	voltage	
I(C):	mag: 8.9955	phase: 179.971°	device_current	
I(L):	mag: 9.995	phase: -0.0229069°	device_current	
I(I):	mag: 1.41421	phase: 45°	device_current	
I(R):	mag: 0.9995	phase: 89.9714°	device_current	

$$I_x \approx 10 \angle 0^\circ \text{ A}$$