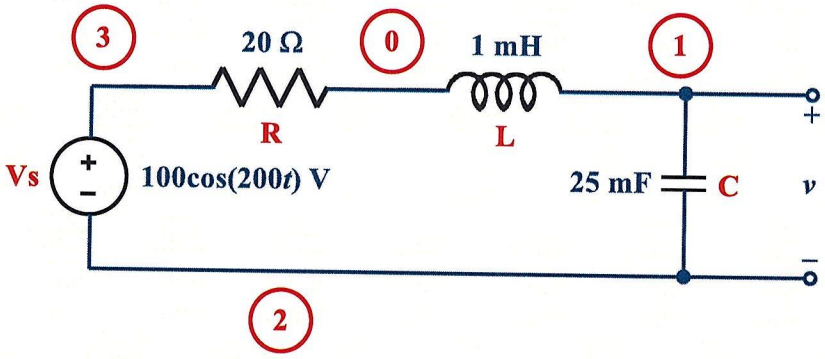
EE 3340

Homework Problem #013

a. For the circuit shown below:



the following LTspice netlist can be used to determine the magnitude and phase angle of the steady-state AC part of *v*:

```
Vs 3 2 AC 100 0
R 3 0 20
L 0 1 1m
C 1 2 25m
.AC DEC 1 31.83098861 31.83098861
```

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

See the attached page.

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

$$V = \frac{\frac{1}{j\omega C}}{R + j\omega L + \frac{1}{j\omega C}} V_s = \frac{V_s}{1 - \omega^2 LC + j\omega RC}$$

$$= \frac{100\angle 0^\circ}{[1 - (200)^2 (0.001)(0.025)] + j(200)(20)(0.025)}$$

$$= \frac{100\angle 0^\circ}{j100}$$

$$= 1\angle -90^\circ \quad V$$

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* Q:\Websites\RES\EE 3340\homework problems\Spring 2022 EE 3340 Homework Problem 13.cir
Vs 3 2 AC 100 0
R 3 0 20
L 0 1 1m
C 1 2 25m
.AC DEC 1 31.83098861 31.83098861
.end

        --- AC Analysis ---

frequency:      31.831          Hz
V(3):           mag:      99.995 phase: 3.01631e-010°       voltage
V(2):           mag: 0.00499975 phase:         180°       voltage
V(1):           mag:    0.999963 phase:    -90.2865°       voltage
I(C):           mag:     4.99975 phase: 3.01631e-010°      device_current
I(L):           mag:     4.99975 phase: 3.01631e-010°      device_current
I(R):           mag:     4.99975 phase: 3.01631e-010°      device_current
I(Vs):          mag:     4.99975 phase:        -180°       device_current
```

$V \approx 1 \angle -90^\circ \quad V$