BERZIET UNIVERSITY

FACULTY OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF ELECTRICAL AND COMPUTER ENGINEERING

ENEE 2102

Circuits Laboratory

Basic Electrical Engineering Lab

Experiment 8 Prelab

Impedance and Sinusoidal Steady State

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Part A: Impedance Measurement

Zr=1kΩ Constant at any frequency.

Zc = 1/jwc = $Zc = \frac{1}{(250*2*\pi*10^{-6})}$ = -j636.9 Ω when f = 250 Hz

$Zc = \frac{1}{(500*2*\pi*10^{-6})j}$ = -j318.5 Ω when f=500 Hz

$Zc = \frac{1}{(1000*2*\pi*10^{-6})j}$ = -j159.2 Ω when f=1000 Hz

$Zc = \frac{1}{(2000*2*\pi*10^{-6})}$ = -j79.6 Ω when f=2000 Hz

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ZL = j*w*L = 2*π*250 *0.1 = j157 Ω f=250 Hz

ZL = j*2*π*500*0.1 = j314Ω f=500 Hz

ZL = j*2*π*1000 *0.1 = j628 Ω f=1000 Hz

ZL = j*2*π*2000 *0.1 = j1256 Ω f=2000 Hz

ZR =100 Ω (do not be affected by frequency)

$ZRC = \sqrt{(ZR^2 + ZC^2)}$

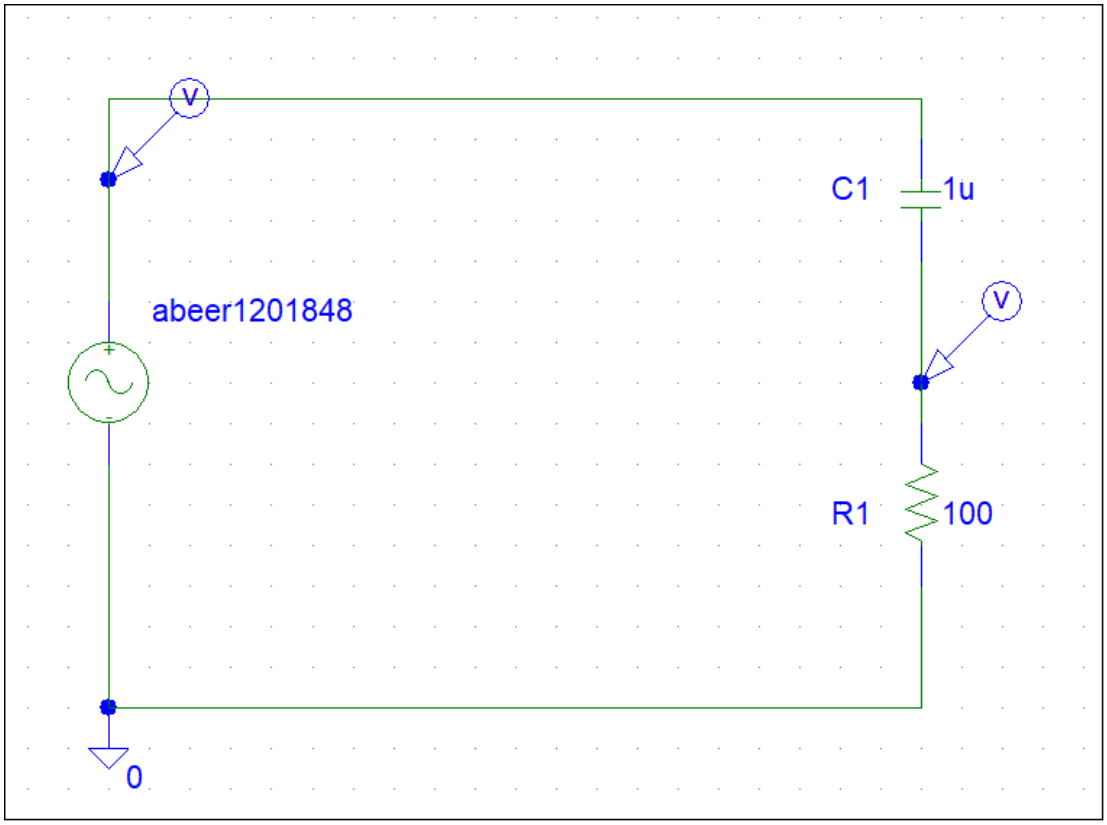
$ZRC = \sqrt{(100^2 + 636.62^2)}$ = 644.4 Ω f=250Hz

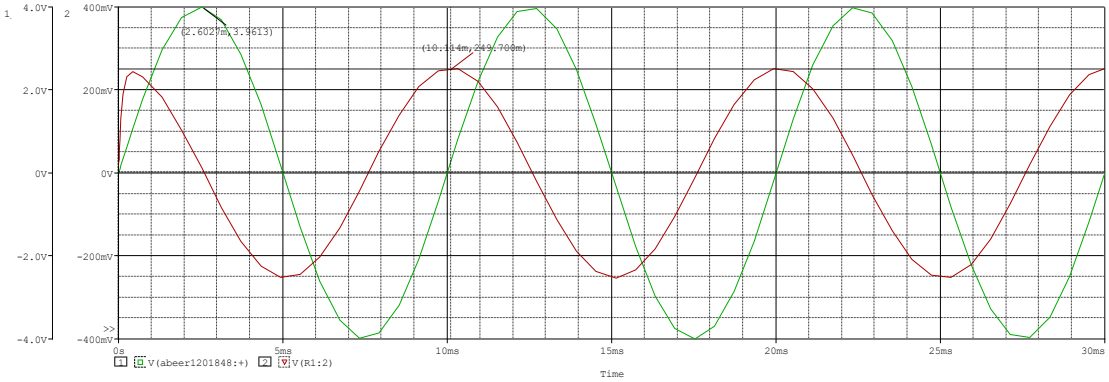
$ZRC = \sqrt{((100^2 + 318.3^2)}$ = 333.6 Ω f=500Hz

$ZRC = \sqrt{((100^2 + 159.1^2)}$ = 187.9 Ω f=1000Hz

$ZRC = \sqrt{((100^2 + 79.5^2)}$ = 127.7 Ω f=2000Hz

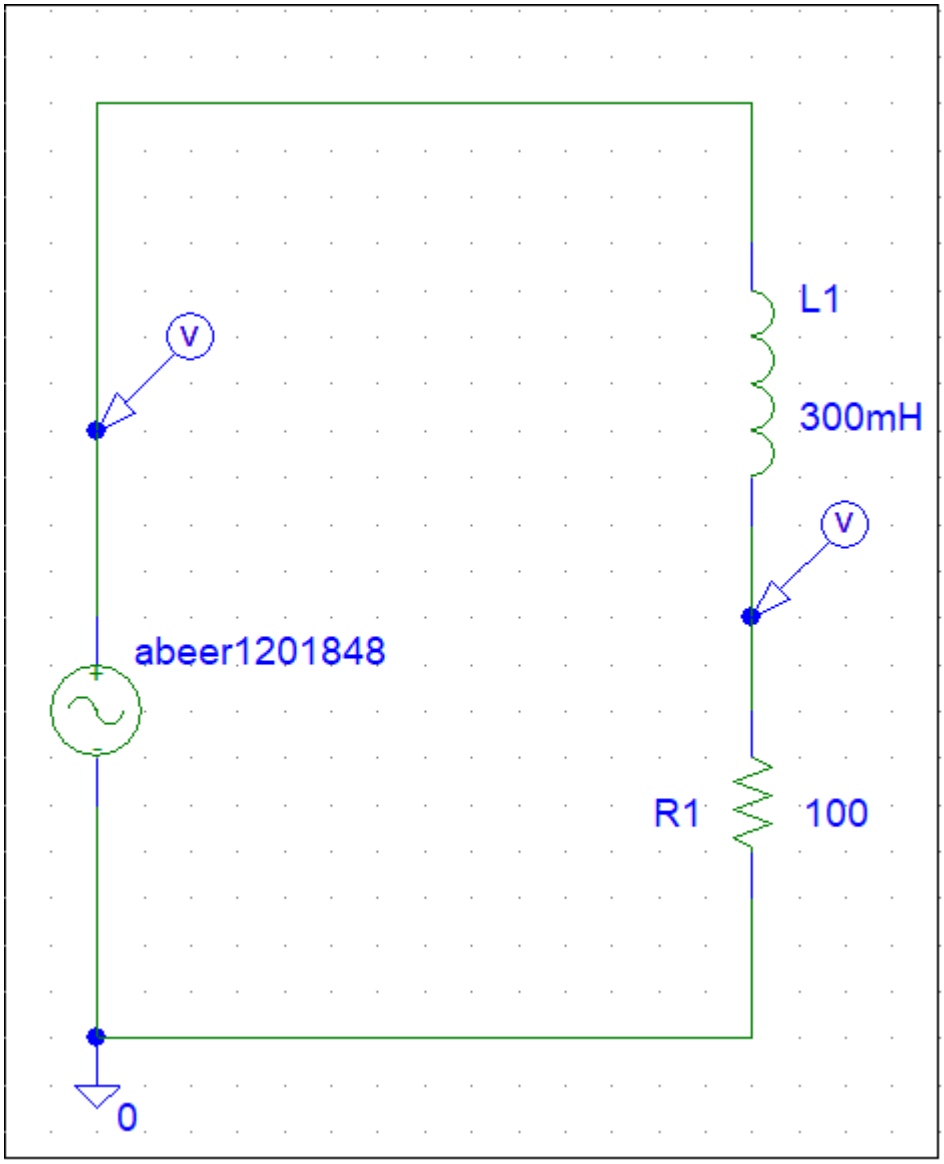
Part B: Phase Measurement

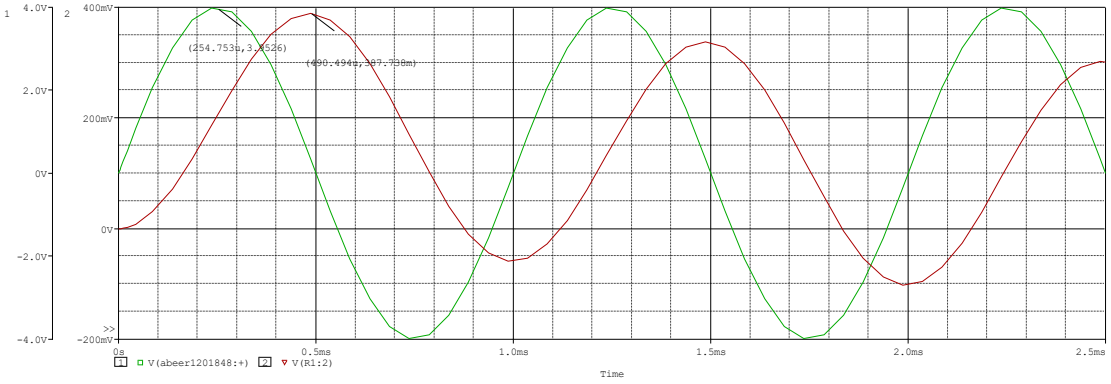




Δt=(10.1-2.6)ms=7.5ms

$$\theta = 360 * f * \Delta t = 360 * 100 * 7.5 * 10^{-3} = 270°$$





Δt=(490-255)μs=0.235ms$\approx 0.24ms$

$$\Delta\theta = 360 * f * \Delta t = 360 * 1000 * 0.24 * 10^{-3} = 86.4° \approx 90°$$