BERZIET UNIVERSITY
FACULTY OF ENGINEERING AND TECHNOLOGY
DEPARTMENT OF ELECTRICAL AND COMPUTER ENGINEERING

ENEE 2110

Circuits Laboratory

Experiment #7 Pre-lab

Impedance and sinusoidal steady state

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Part A: Impedance Measurement

1. For the circuits shown in Figures 7.7 - 7.10 **calculate the magnitude of the impedances** ZR, ZC, ZL, and ZRC respectively, for the following frequencies: 250, 500, 1000 and 2000 Hz.

1. Connect the circuit in Figure 7.7, set V_{in} to sinusoidal voltage at 8 V_{PP}, f = 250 Hz

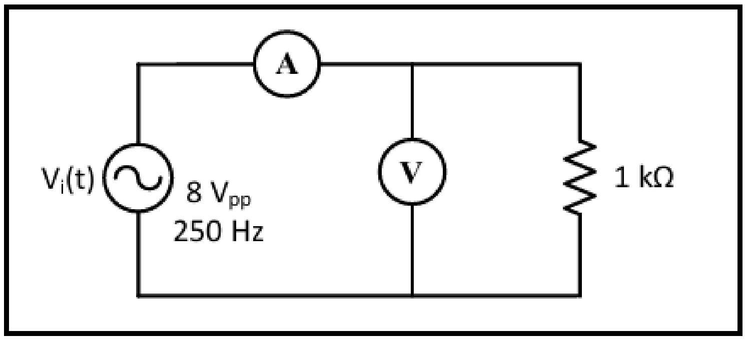


Figure 7.7

ZR = 1kΩ at any frequency(constant)

2. Connect the circuit in Figure 7.8, set V_{in} to sinusoidal voltage at 8 V_{PP}, f = 250 Hz.

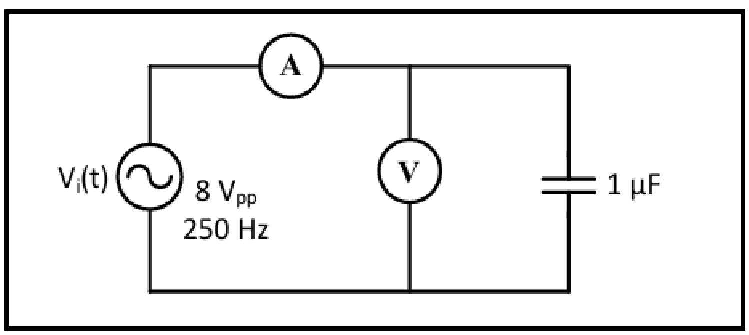


Figure 7.8

Zc = 1/wc = 1/(250 *2*π *1*10-6) = 636.6 Ω f = 250 Hz

Zc = 1/(500*2*π*10-6) = 318.3 Ω f=500 Hz

Zc = 1/(1000*2*π*10-6) =159.2 Ω f=1000 Hz

Zc = 1/(2000*2*π*10-6) = 79.6 Ω f=2000 Hz

3. Connect the circuit in Figure 7.9, set V_{in} to sinusoidal voltage at 8 V_{PP}, f = 250 Hz.

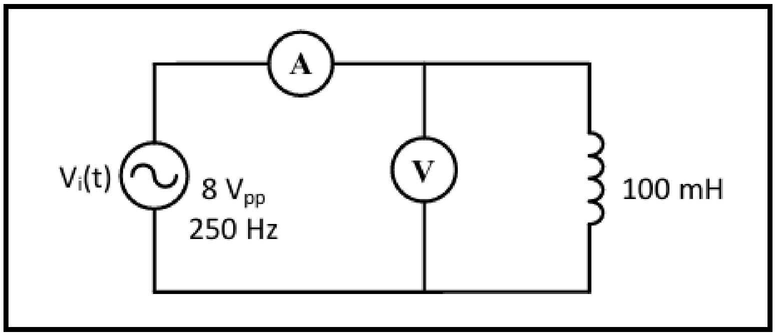


Figure 7.9

ZL = w*L = 2*π*250 *0.1 = 157 Ω f=250 Hz

ZL = w*L = 2*π*500*0.1 = 314Ω f=500 Hz

ZL = w*L = 2*π*1000 *0.1 = 628 Ω f=1000 Hz

ZL = w*L = 2*π*2000 *0.1 = 1256 Ω f=2000 Hz

4. Connect the circuit in Figure 7.10, set V_{in} to sinusoidal voltage at 8 V_{PP}, and f = 250 Hz.

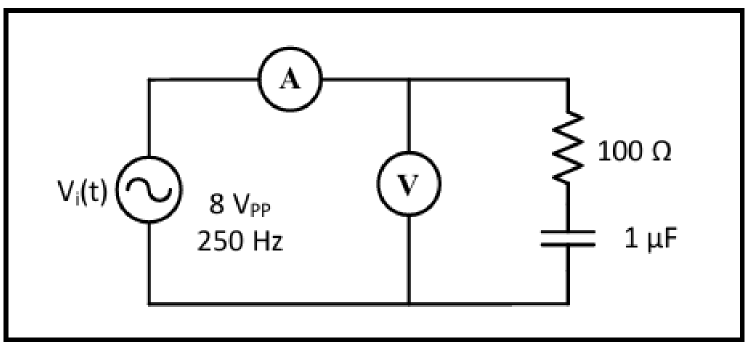


Figure 7.10

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

ZRC = √ (ZR2 + ZC2)

ZRC = √ (1002 + 636.62) = 644 Ω f=250Hz

ZRC = √ (1002 + 318.32) = 333.6 Ω f=500Hz

ZRC = √ (1002 + 159.12) = 188Ω f=1000Hz

ZRC = √ (1002 + 79.52) = 127 Ω f=2000Hz

Part B: Phase Measurement

1. For the circuit shown in Figure 7.11

a. Use PSPICE to do transient analysis of the circuit, show Vin(t) and VR(t) on one plot

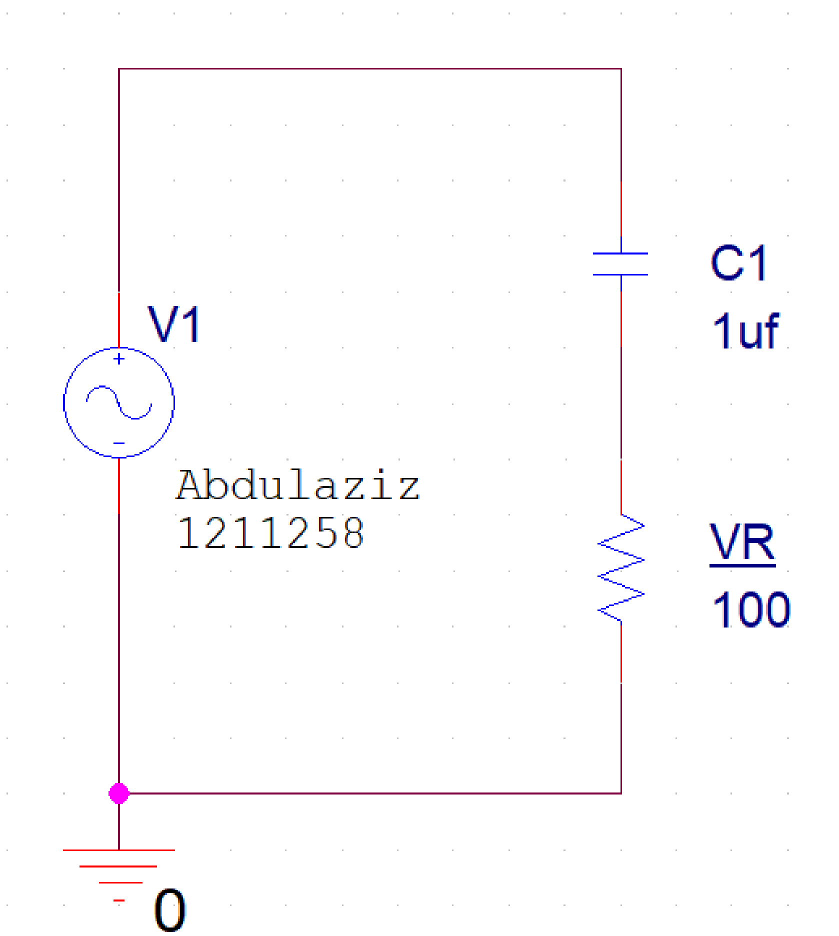
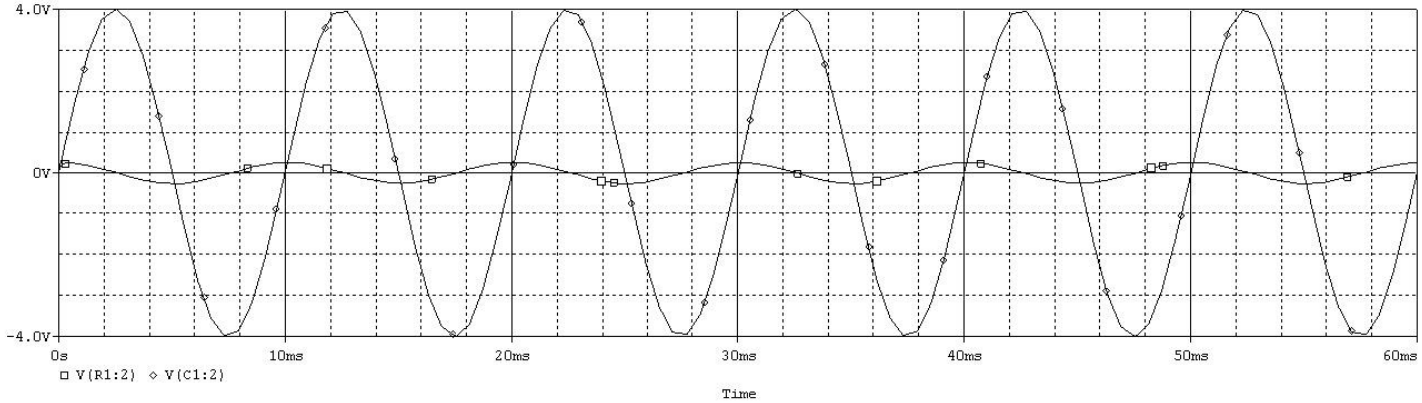
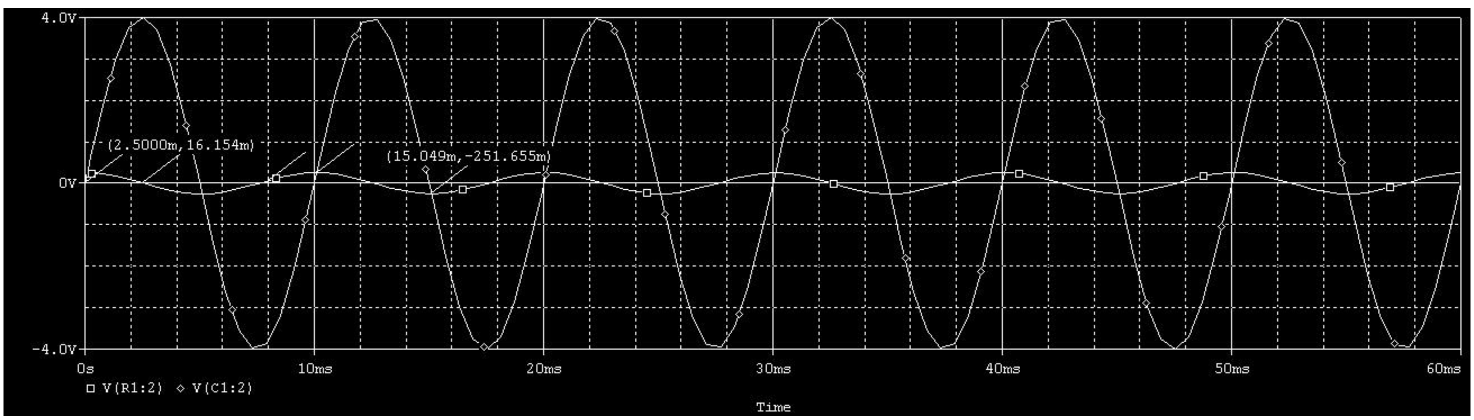


Figure 7.11



B- Use cursors to measure the time difference between the peaks of the two signals, then use the following relationship to calculate the phase shift using the measured time {Δθ = 360° x f x Δt}.



From the figure above

Δt =(5-7.5)ms = -2.5ms

Δθ = 360 * f * Δt = 360 *100*2.5*10-3 =- 90°

1. For the circuit shown in Figure 7.12

2. Connect the circuit in Figure 7.12, set Vin to sinusoidal voltage at 8 VPP and f = 1 KHz

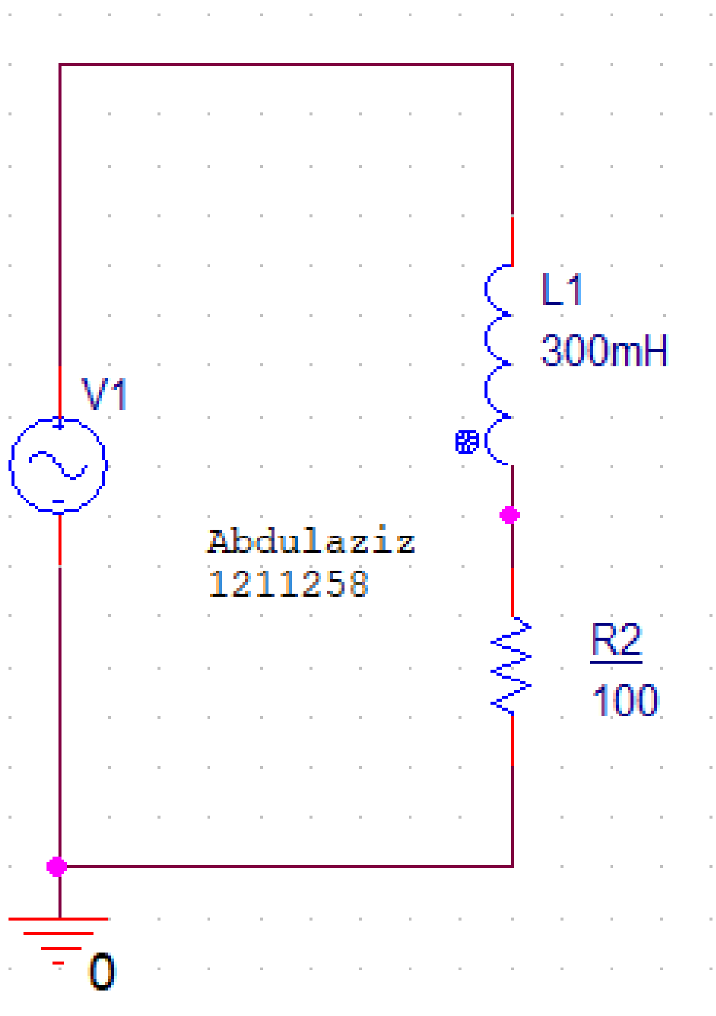
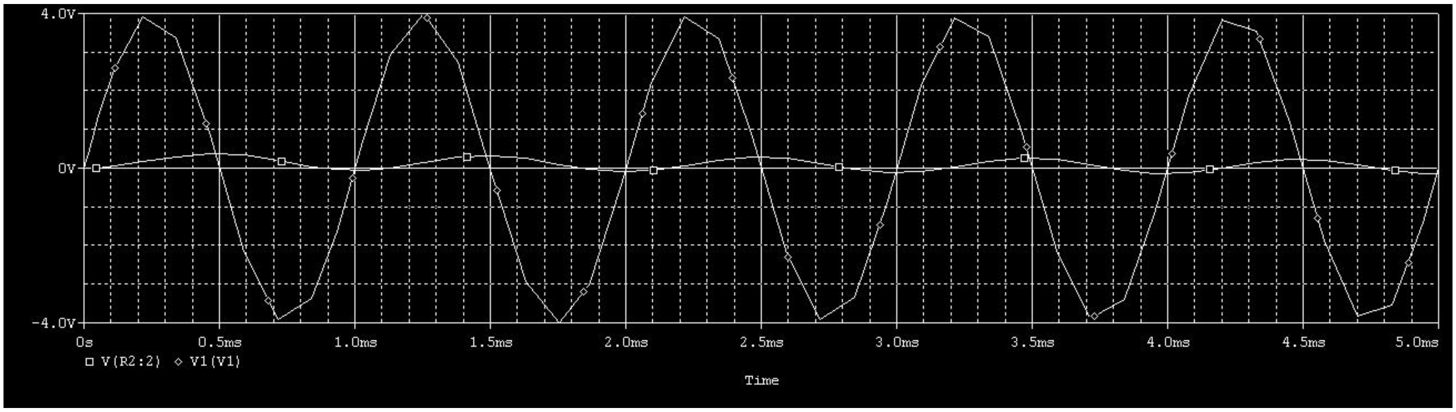
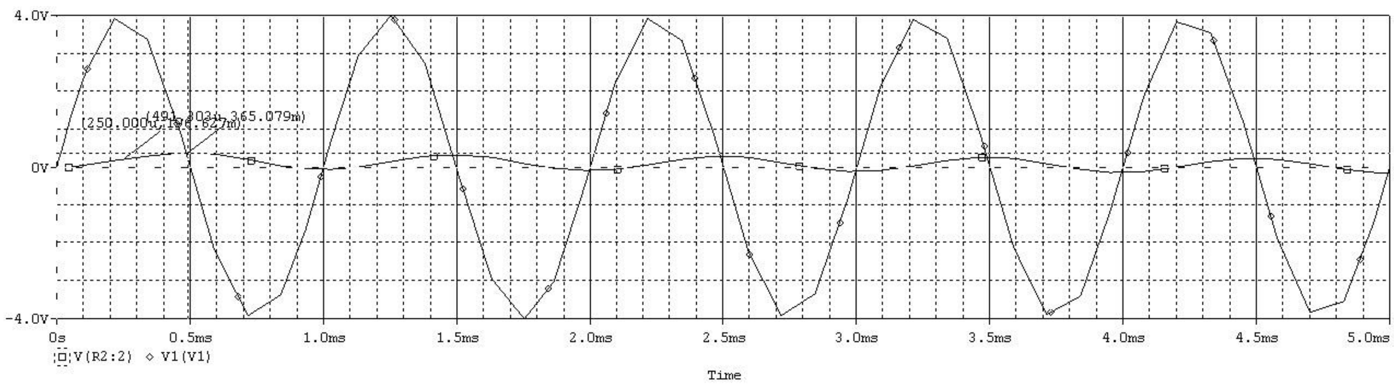


Figure 7.12





b. Use cursors to measure the time difference between the peaks of the two signals, then use the following relationship to calculate the phase shift using the measured time {Δθ = 360° x f x Δt}.

From the figure above

Δt =(0.5-0.25)ms = 0.25ms

Δθ = 360 * f * Δt = 360 *1000*0.25*10-3 = 90°