ECE2101L
Electrical Circuit Analysis II Laboratory

Lab 9
Real, Reactive, Complex Power and Power Factor

Report

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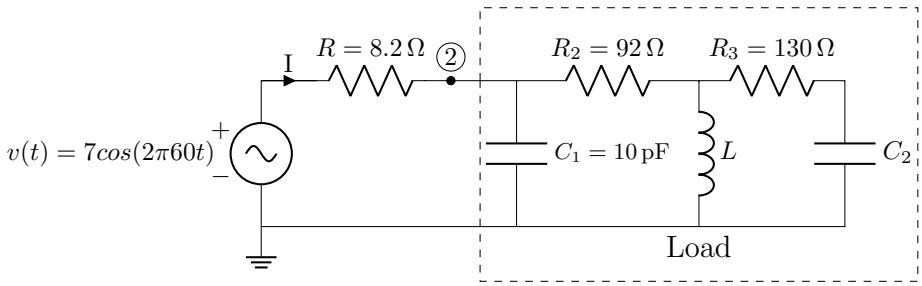
1 Determination of load power using oscilloscope



Procedure

The above circuit was simulated with LTspice XVI with the RMS value of source voltage.

Result

Variant	V_2 RMS calculated	I RMS calculated	P calculated	Q calculated
original	$4.59698\angle 1.66598°$ V	$46.2263\angle -20.6450°$ mA	0.196593 W	0.0806727 VAR

Variant	V_2 RMS measured	I RMS measured	P measured	Q measured	P error	Q error
original	$4.59698\angle 1.66595°$ V	$46.2259\angle -20.6449°$ mA	0.196591 W	0.0806715 VAR	0.00%	0.00%
$C_2 = 1000\,\mu\text{F}$	$4.61679\angle 1.31314°$ V	$42.7464\angle -17.5681°$ mA	0.186732 W	0.0638643 VAR	N/A	
$L = 0.4\,\text{H}$	$4.83025\angle 2.21037°$ V	$27.2304\angle -56.5461°$ mA	0.068221 W	0.1124540 VAR		

Variant	Load total Z calculated	$\lvert S\rvert$ calculated	PF measured	
original	$107.076\angle 20.6450°\,\Omega$	0.212501 VA	0.925138	lagging
$C_2 = 1000\,\mu\text{F}$	No calculation		0.946191	lagging
$L = 0.4\,\text{H}$			0.518677	lagging

Analysis

From the result we observed that the load power factor have no relation to the magnitude of the load current. The power factor increase with increase of capacitance and decrease with increase of inductance. The angle of load total impedance is roughly the same as the load power angle. Power factor increases with decrease of load power angle and vice versa.

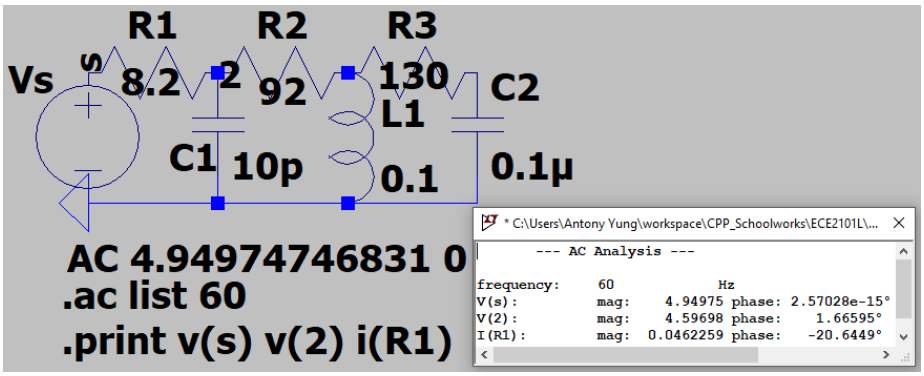


Figure 1: Simulation of the original circuit

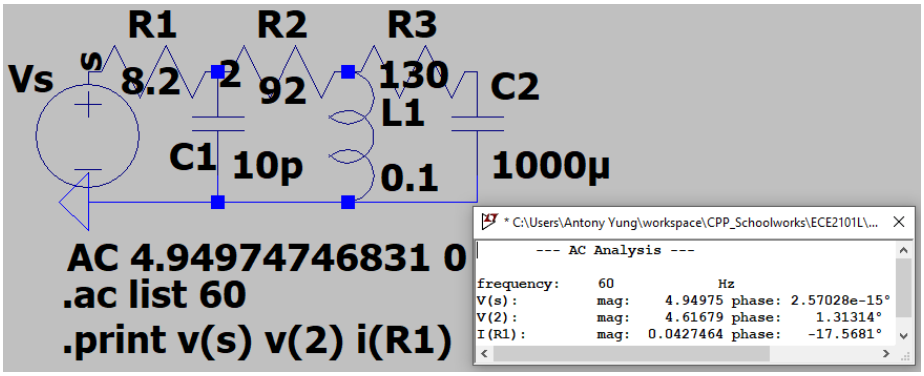


Figure 2: Simulation of the $C_2 = 1000\,\mu\text{F}$ circuit

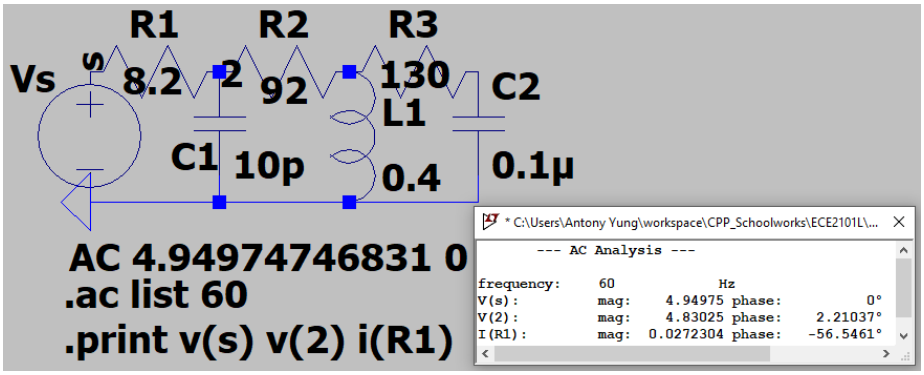


Figure 3: Simulation of the $L = 0.4\,\text{H}$ circuit

2 Determination of load real power using multimeter

Procedure

The original circuit was simulated with LTspice XVI with the RMS value of source voltage and current of R_2 and R_3.

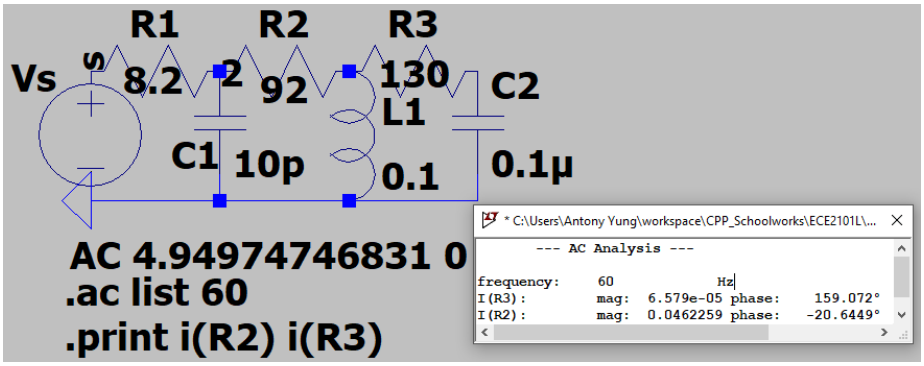


Figure 4: Simulation of the original circuit with measurement of I_2 and I_3

Result

Variant	P from B1 measured	I_2 RMS measured	I_3 RMS measured	P measured	P error
original	0.196591 W	$46.2259\angle -20.6449°$ mA	$65.79\angle 159.072°$ µA	0.196589 W	0.00%