# ECE2101L
# Electrical Circuit Analysis II Laboratory

# Lab 9
# Real, Reactive, Complex Power and Power Factor

# Report

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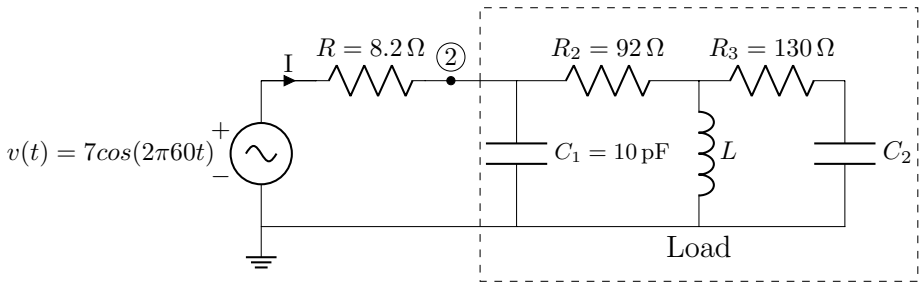
# 1 Determination of load power using oscilloscope




## 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 | $99.4451\angle 22.3110°\,\Omega$ | 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 the same as the load power angle. Power factor increases with decrease of load power angle and vice versa.

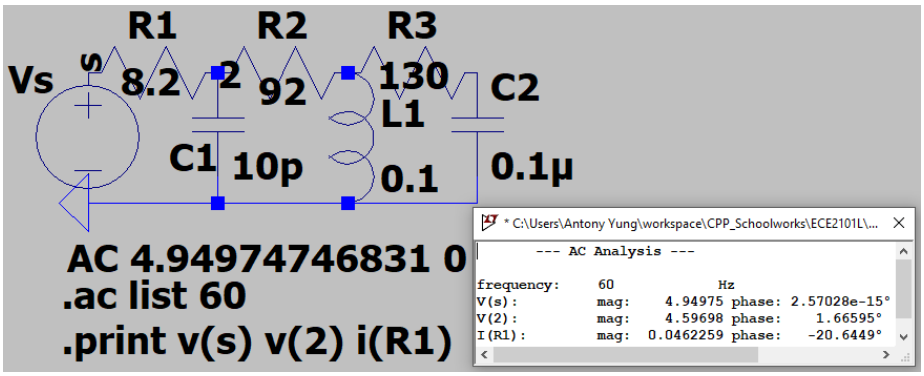



Figure 1: Simulation of the original circuit

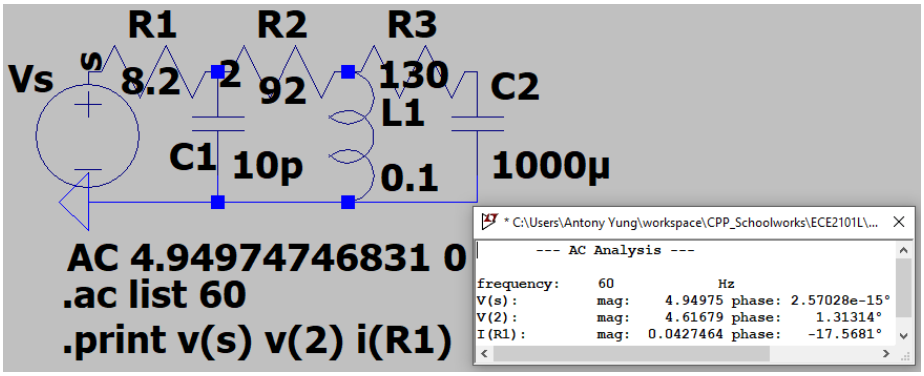



Figure 2: Simulation of the $C_2 = 1000\,\mu\text{F}$ circuit

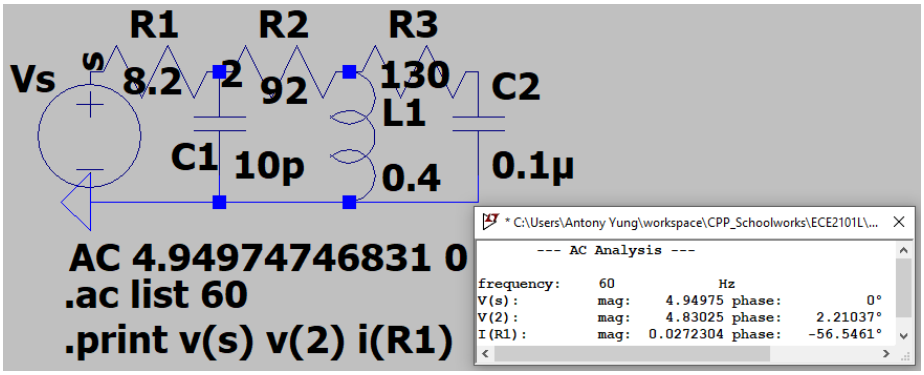



Figure 3: Simulation of the $L = 0.4\,\text{H}$ circuit

# 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 $R_3$.

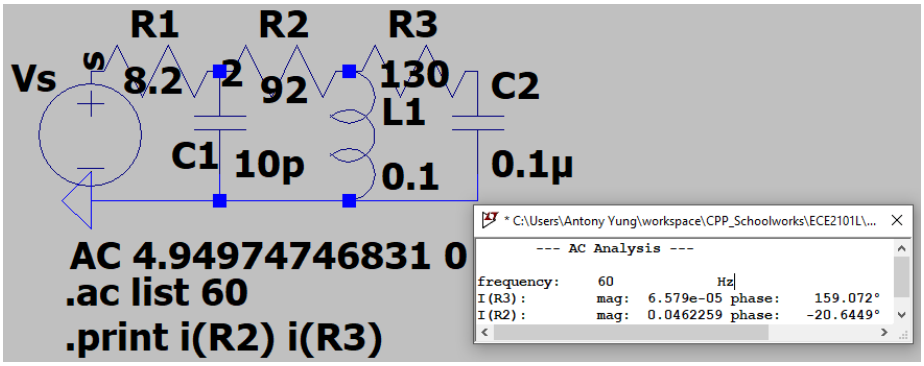



Figure 4: Simulation of the original circuit with measurement of $I_2$ and $I_3$

## 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% |