EE 206 Circuit Theory

Lab 2

Average Power and Reactive Power

The aim of this lab is to analyze ac power for purely resistive, inductive and capacitive circuits.

Lab procedure

1. Purely resistive circuit:

Connect an ac voltage source to a resistor as shown below:

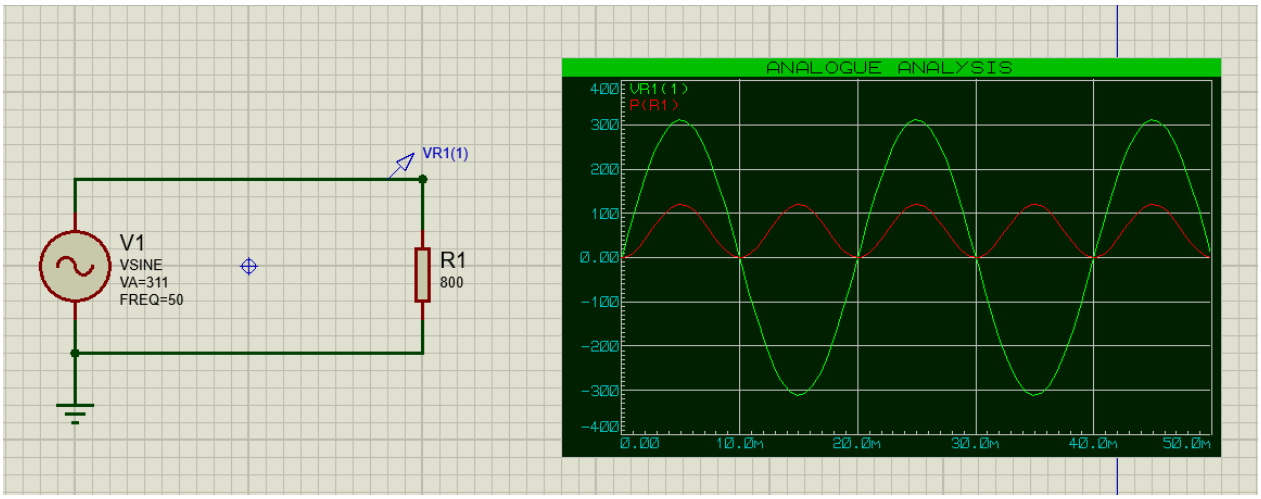

Figure 1. ac power

Plot the instantaneous power and measure the average power. Fill the table below. You can maximize the graph by right clicking and select "maximize". Then, place a cursor to read the values on the average power. Remember, for resistive circuits, $\theta_v = \theta_i$.

Table 1.

$P_{avg} = V_m^2/2R$ (Calc.)	P_{avg} (Measured)	$p = P_{avg} + P_{avg}\cos(2\omega t)$

2. Purely inductive circuit:

Connect and ac voltage source to an inductor as shown below:

Note that we have to connect a series 1Ω resistor, otherwise the circuit doesn't work.

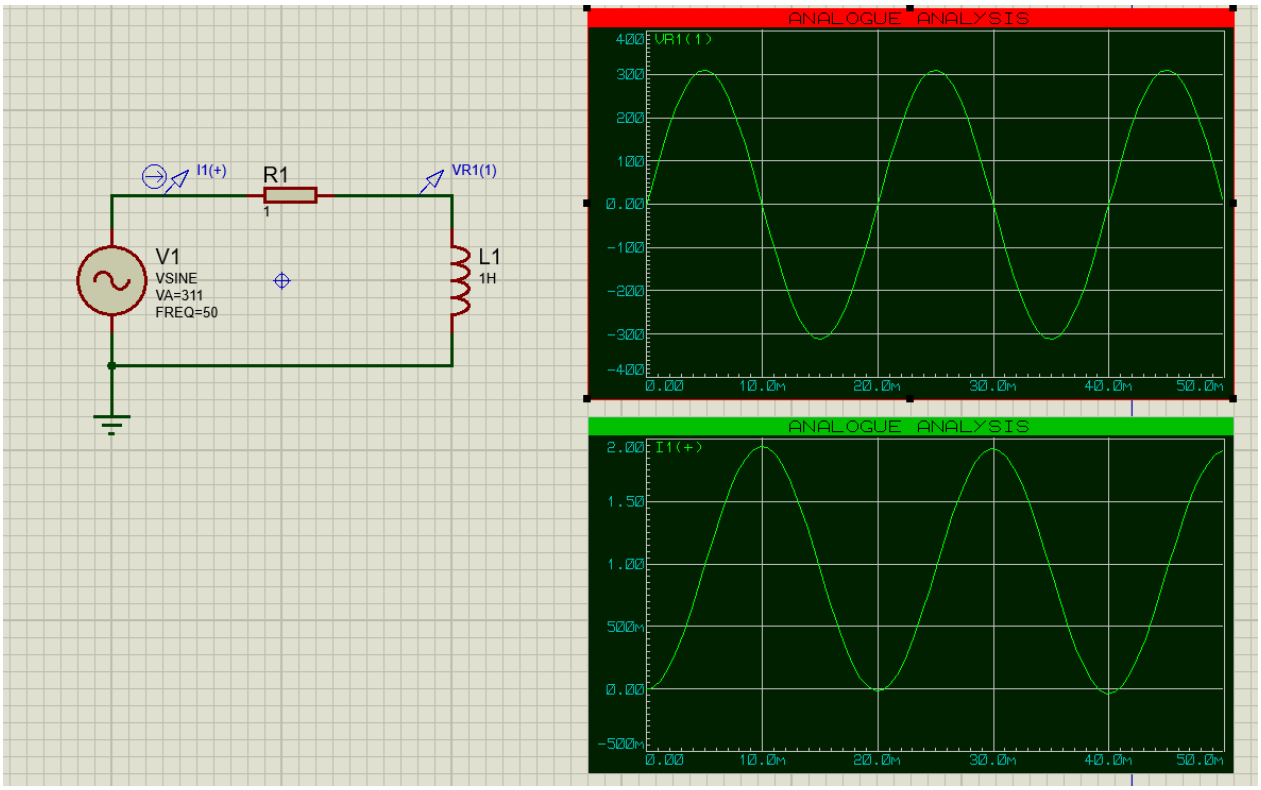

Figure 1. ac power (purely inductive)

Note that the current lags the voltage by 90^0.

Fill the table below. Write the expressions for the voltage and the current. Write the expression for the reactive power Q, and the instantaneous power

$$p = -Qsin(2\omega t)$$

where

$$Q = \frac{V_m I_m}{2}\sin(\theta_v - \theta_i).$$

Table 2.

$v(t)$ (measured)	$i(t)$ (measured)	Q (reactive power)	p (inst. power)

1. Purely capacitive circuit:

Connect and ac voltage source to a capacitor as shown below:

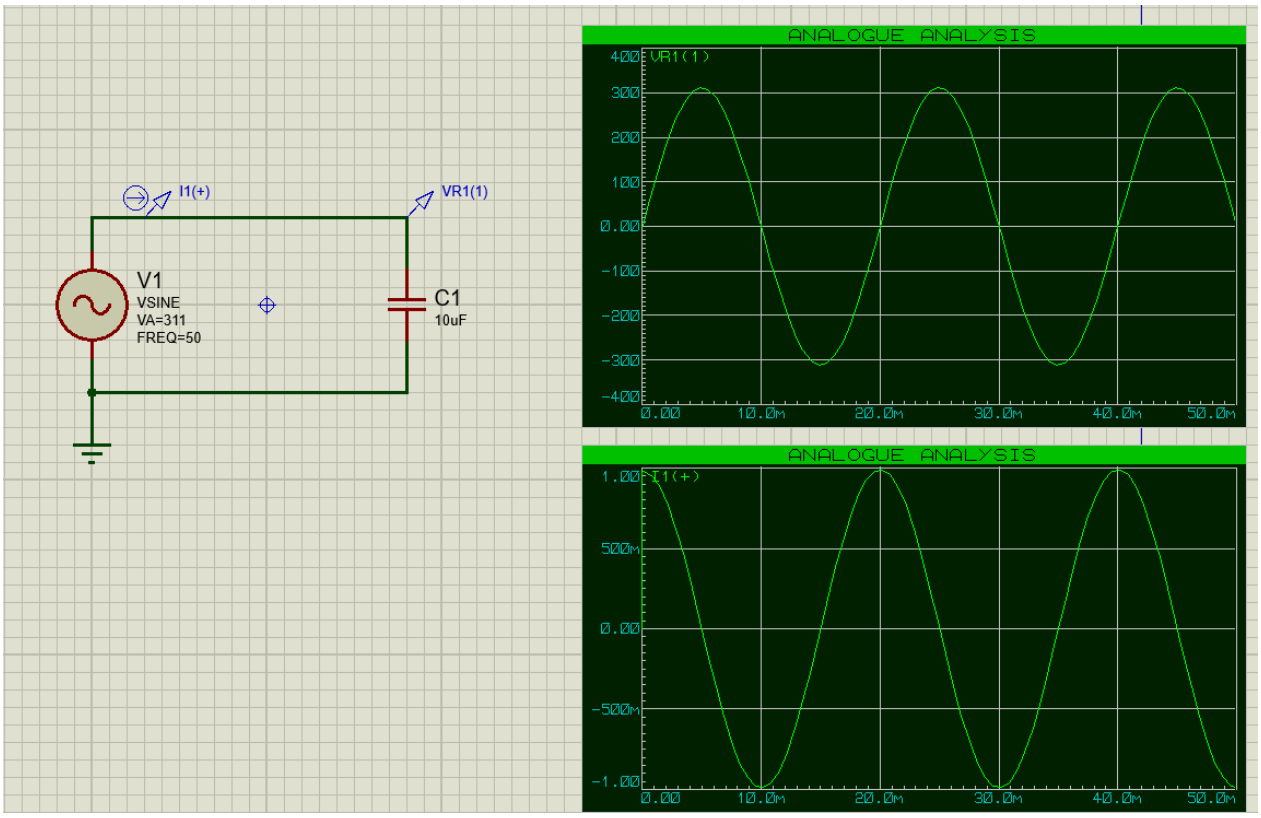

Figure 1. ac power (purely capacitive)

Note that the current leads the voltage by 90^0.

Fill the table below. Write the expressions for the voltage and the current. Write the expression for the reactive power Q, and the instantaneous power

$$p = -Qsin(2\omega t)$$

where

$$Q = \frac{V_m I_m}{2}\sin(\theta_v - \theta_i).$$

Table 3.

$v(t)$ (measured)	$i(t)$ (measured)	Q (reactive power)	p (inst. power)

Results and Conclusion:

Write the summary of what you have learned in this lab.