BERZIET UNIVERSITY

FACULTY OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF ELECTRICAL AND COMPUTER ENGINEERING

ENEE 2102

Circuits Laboratory

Experiment.9 Prelab

AC & DC Power Analysis and Design

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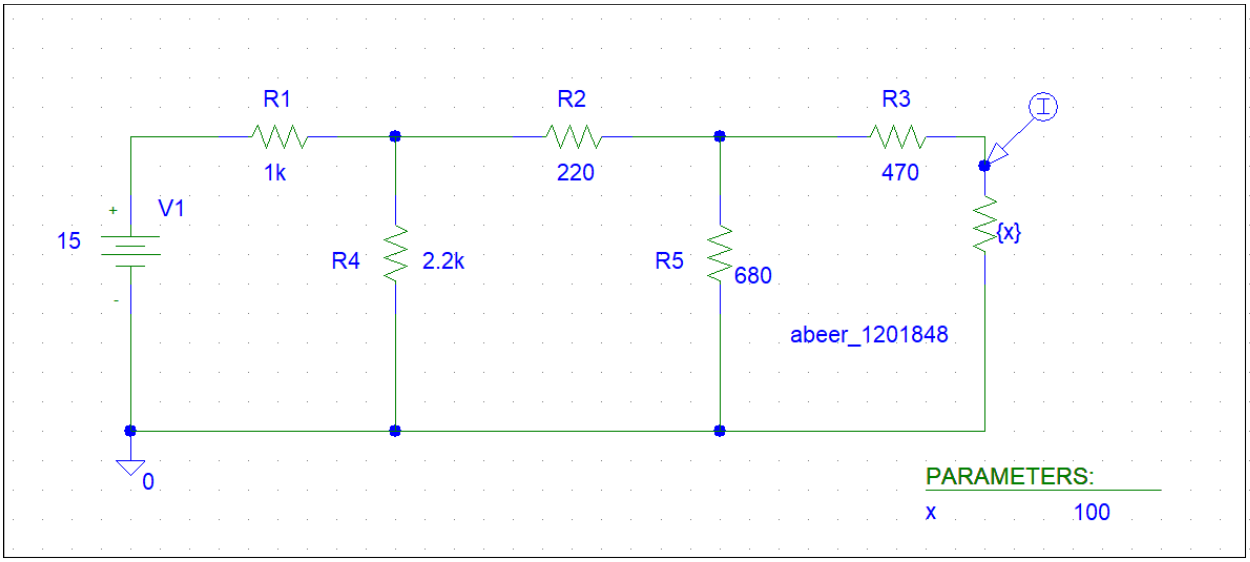
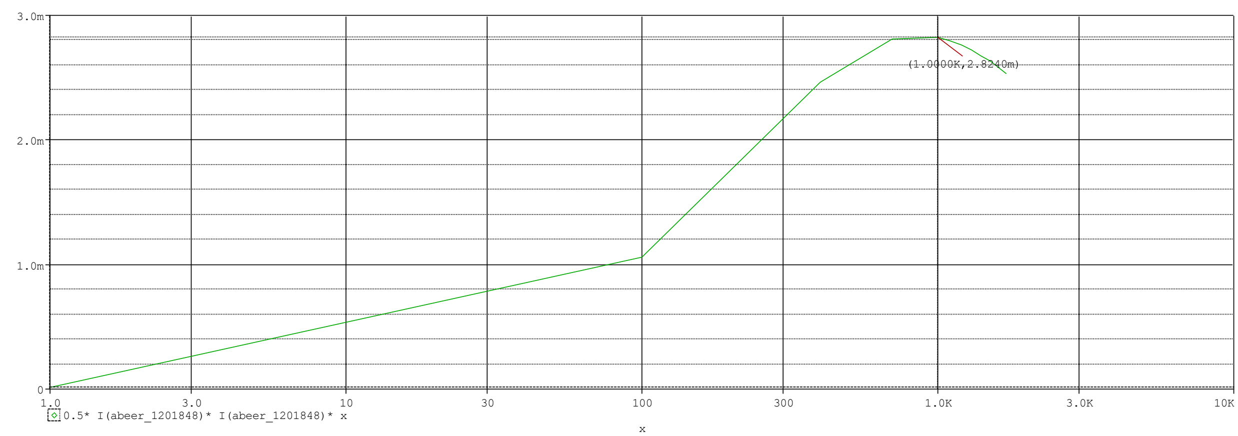
1. Make a DC sweep for RL in the circuit of Figure 9.5 to produce a plot of (PLOAD vs. RL) for the range of values of RL shown in Table 9.2, use cursors to find the value of RL that results in maximum power transfer to RL





2.For the circuit of Figure 9.6:

- Use phasor analysis to calculate VL and IL, assume the input voltage Vin = 8 VPP∠0°.
- Calculate the complex power of the load" SL.

A.calculate V_L and I_L ,assume the input voltage $V_{in} = 8V_{pp}$

$V_{rms} = \text{V}_{\text{pp}}/2\sqrt{2}$

$V_{rms} = 2.83\ volt$

$I_{in} = \frac{V_{in}}{Z}$

Z=100+680+j942

Z=780 + j942 Ω

Z = $1223.4 < 50.38^0$ K Ω

V_{in}= 2.82$< 0^0$ volt

I_{in}=$\left(\frac{2.83<0^0}{1223.4<50.38^0}\right)$

I_{in} = 2.305$*$ $\mathbf{10^{-3}} < -50.3^0$ mA

Now,

$\boldsymbol{I_L}$ = $\boldsymbol{I_{in}}$ =**2.305**$*$ $\mathbf{10^{-3}} < \mathbf{-50.38^0}$

$V_L = I_L\ x\ Z_L$

V_L =2.305$*$ $\mathbf{10^{-3}} < -50.3^0$ * 1162.2$< 54.2^0$

$\boldsymbol{V_L}$ = **2.67**$< \mathbf{3.82^0}$

$s = Vrms * Irm$

s =2.67< 3.82^0*2.305< -50.38^0

=6.141*10^{-3} < -46.56^0

Q = $\frac{v^2}{Xc}$

$$x_C = \frac{v^2}{Q}$$

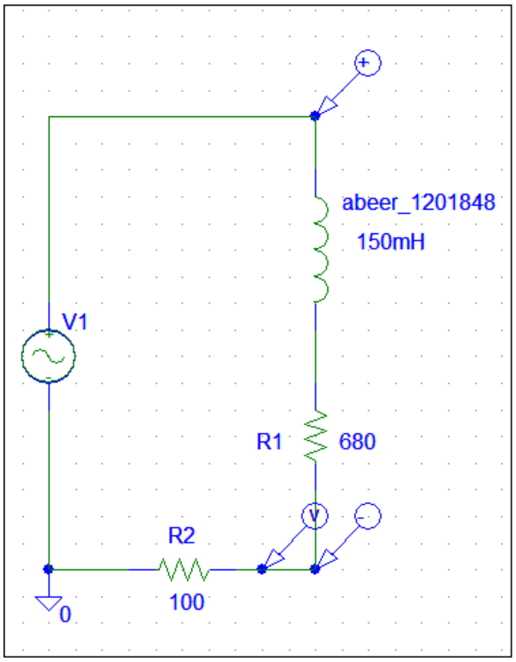
$$= \frac{2.83^2}{6.141*10^{-3} \quad SIN90} = 1304.2uF$$

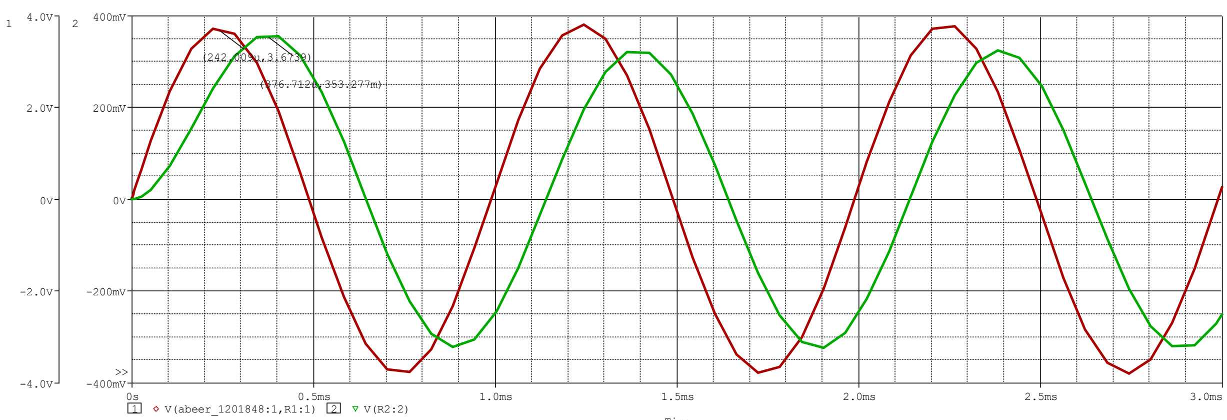
$$\frac{1}{2*Pi*f*c} = 1304.2$$

C=1.2*10^{-7}

-Use PSPICE to do transient analysis of the circuit in Figure 9.6, show $I_L(t)$ and $V_L(t)$ on one graph, you will need different Y-axis, and measure the power factor (from the time difference between the two waveforms).

WITHOUT CAPACITOR





Δt =376.721$*10^{-6}$-242.009$*10^{-6}$

$\Delta t = 1.34712 * 10^{-4}\ sec$

Power factor =cos($\theta v - \theta i$)

$\Delta\theta$ = $360^0 x f x \Delta t$

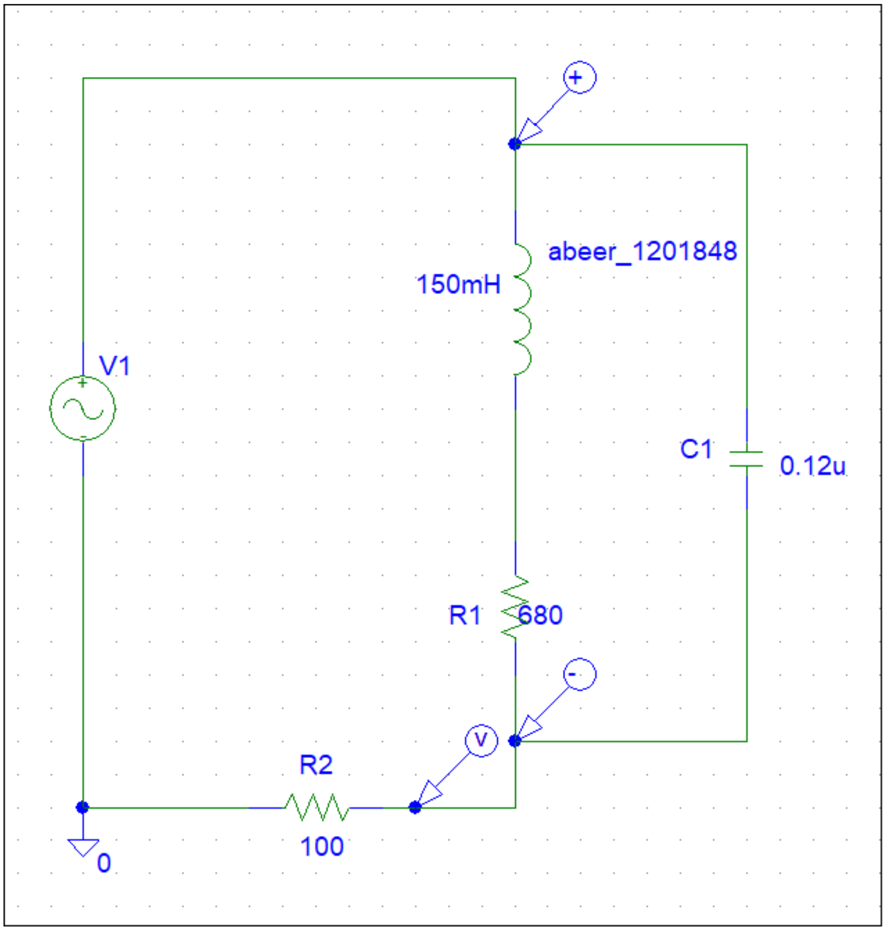
$\Delta\theta$ = $360^0 x 1 x 10^3 x 1.34712 * 10^{-4}$

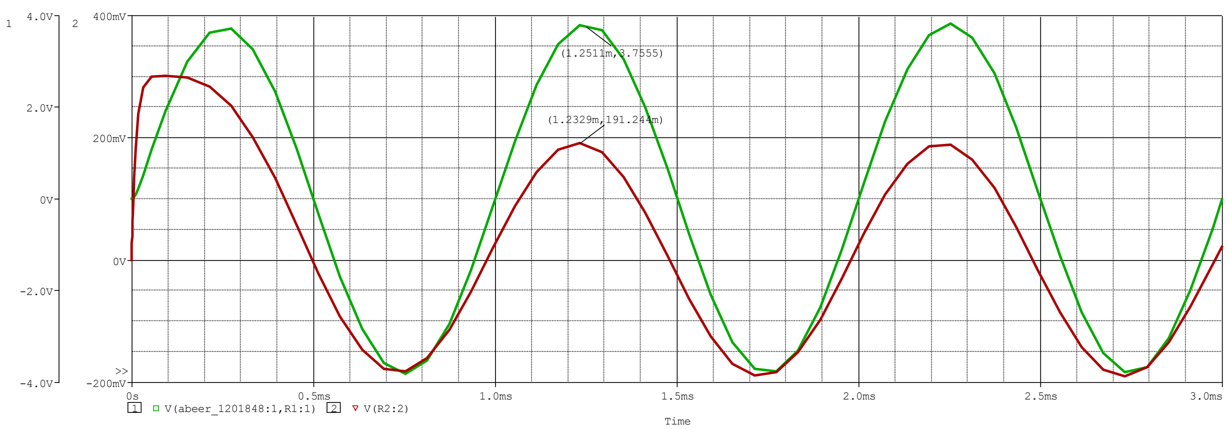
$\Delta\theta$ =48.49^0

P.F=cos$\theta = 0.6627$

- Repeat the previous step with the added capacitor to show power factor improvement.

WITH CAPACITOR





Δt =1.2511$*$ 10^{-3}-1.2329$*$ 10^{-3}

$\Delta t = 1.34712 * 10^{-4}\ sec$

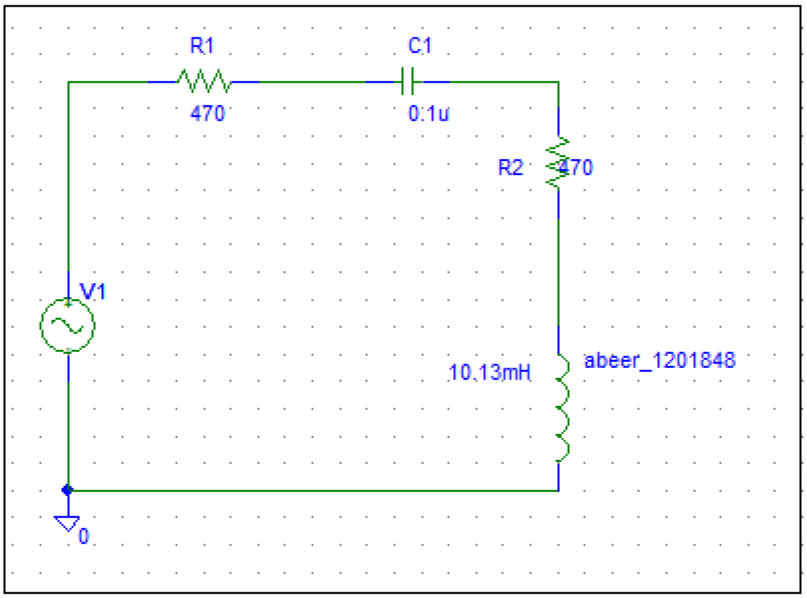
Power factor =cos($\theta v - \theta i$)

$\Delta\theta$ = $360^{0} x f x \Delta t$

$\Delta\theta$ =6.588^{0}

P.F=cos$\theta = 0.99$

1. For the circuit of Figure 9.8, design a load that is when connected to the output terminals of the circuit will extract maximum average power, then calculate magnitude of P_{Max}.



Z_L=Z_{TH}

$Z_{TH} = 470 - J * x_C$

$Z_{TH} = 470 - Jx_{C=}Z_L$

Z_L=470+Jx_L

$R_L = 470$

$x_{L=}x_C$

2*Pi*F* L= $\frac{1}{2*Pi*f*c}$

L= $\frac{1}{(2*Pi*f)^2*c}$**=10.13mH**