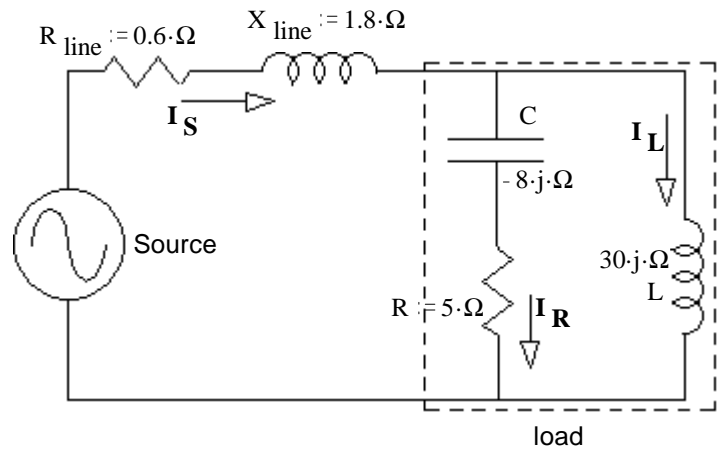


# ECE 3600 Exam 1 given: Fall 21

1. (38 pts) R, L, & C together are the load (in dotted box). The power used by the load is  $P_{\text{Load}} := 720 \text{ W}$  Find:

a) The magnitude of the resistor current.  
 $|\mathbf{I}_R| = ?$



b) The voltage at the load (magnitude).  $V_{\text{Load}} = ?$

c) The reactive power used by the load.  $Q = ?$

d) The apparent power of the load.  $|\mathbf{S}| = S = ?$

e) The power factor of the load.  $\text{pf} = ?$

f) This power factor is: i) leading ii) lagging (circle one)

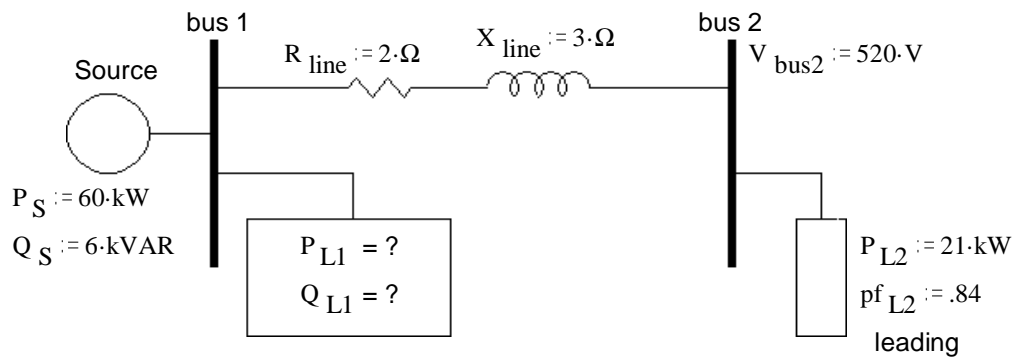
g) The magnitudes of the other currents.  
 $|\mathbf{I}_L| = ?$        $|\mathbf{I}_S| = ?$

i) Is there something weird about this voltage? If so, what?

j) Why?

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2. (40 pts) A one-line drawing of a 3-phase system is shown. Some 3-phase  $P_s$  and  $Q_s$  are also shown. Remember that bus and line voltages are the same. Hints: Work from load 2 back and if you don't use  $P_s$  and  $Q_s$  to solve this problem it will be VERY HARD!



a) Find the line current.

2. continued b) Find the complex power consumed by load 1.

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c) What is the line voltage at bus 1?

d) What is the efficiency of this system?  $\eta = ?$

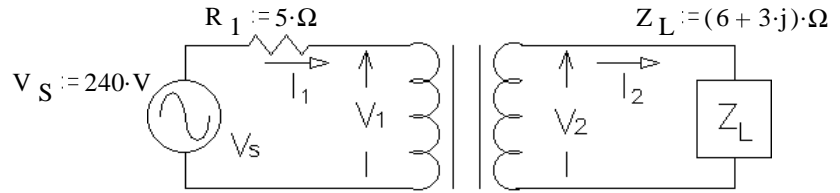
**ECE 3600 Exam 1 Fall 21 p4**

3. (22 pts) The transformer shown in the circuit below is ideal. It is rated at 300/100 V, 1 kVA, 60 Hz

Find the following:

a) The primary current (magnitude).

$|\mathbf{I}_1| = ?$



c) The secondary voltage (magnitude).  $|\mathbf{V}_2| = ?$

b) The secondary current (magnitude).  $|\mathbf{I}_2| = ?$

d) Is this transformer operating within its ratings? Show your evidence.

**Answers**

1. a) 12·A    b) 113.2·V    c) -724.8·VAR    d) 1022·VA    f) i)    g) 9.024·A    h) 106.6·V

i)  $V_S < V_{Load}$     j) Because the Q of the line partially cancels the Q of the load  
OR Partial resonance between the inductance in the line and the capacitance of the load.

2. a) 27.76·A    b) 34.38·kW    c) 550.5·V    d) 92.3·%

3. a) 3.699·A    b) 11.1·A    c) 74.44·V    d) NO, currents