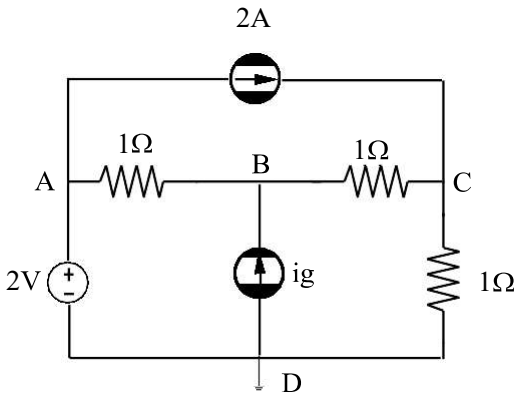
ELECTRICAL POWER ENGINEERING FUNDAMENTALS

FINAL EXAM. ORDINARY CALL (January 10th, 2020)

Exercise 1

For the circuit below:

a) Write the equations for the mesh analysis
b) Knowing that the power delivered by the voltage source is 0, calculate ig
c) Calculate the Thevenin's equivalent of the circuit between B and D including all the elements of the circuit in it except the current source ig.



Exercise 2

In the circuit below:

$u_1(t) = \sqrt{2} \cdot 10 \cdot cos(100t)\ V$

$u_2(t) = \sqrt{2} \cdot 5 \cdot cos(100t + 90)\ V$

$i_3(t) = \sqrt{2} \cdot 10 \cdot cos(100t + 30)$ A

$R = 5\ \Omega; L = 5\ mH; C = 5\ mF$

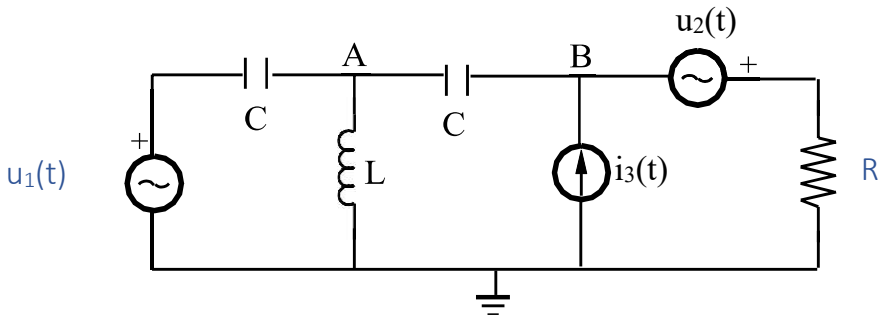
a) Apply nodal analysis to find the nodal voltages $u_A(t)$ and $u_B(t)$

b) Do a power balance of the circuit

c) We want to add a current source to the circuit, connected between terminals A and B, so that the voltage drop across the resistor R (+ up – down) becomes:

$$u_R(t) = 25 + \sqrt{2} \cdot 7 \cdot cos(100t - 48)\ A$$

Determine the instantaneous value and the polarity of the source.



Exercise 3

The following diagram represents a three-phase system wich supplies energy to two three-phase loads. Load 1 is Y connected and Load 2 is Δ connected. The impedance per phase of each load is indicated in the diagram. The loads are connected to a generator by means of a distribution line with impedance Z_{DL}= 3+j Ω.

The phasor line voltage at the load end of the system has a constant value Ua'b'=380 /30º V.

a) Draw the one-phase equivalent of the system.

b) Determine the measure of the ammeter

c) Determine the modulus of the line voltage at the generator

d) Calculate the active and reactive power absorbed by load 1 and load 2, the power factor of each load and the power factor of the set formed by the two loads.

e) Calculate the measure of the wattmeter