Electrical power engineering fundamentals
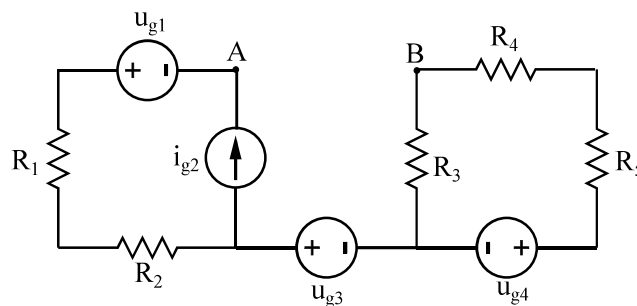
Partial exam. 25th November 2020

Instructions Solve the problems using the methods indicated in the problem statements and write a summary of your results in this paper. Only the solutions obtained with these methods will be graded.

Name...

DC Circuits

Given that the values of the parameters are $R_1 = 1\Omega$, $R_2 = 2\Omega$, $R_3 = 3\Omega$, $R_4 = 4\Omega$, $R_5 = 5\Omega$, $u_{g1} = 1V$, $i_{g2} = 2A$, $u_{g3} = 3V$, $u_{g4} = 4V$

a) Find the Thevenin equivalent in the circuit of the figure on the left between A and B **including all the elements of the circuit in it**. Draw the equivalent indicating the obtained values for the parameters. (6.5 points)

b) Calculate the value of the resistor R_L that must be connected between A and B to extract the maximum power from the circuit. Calculate the power absorbed by the resistor. (3.5 points)
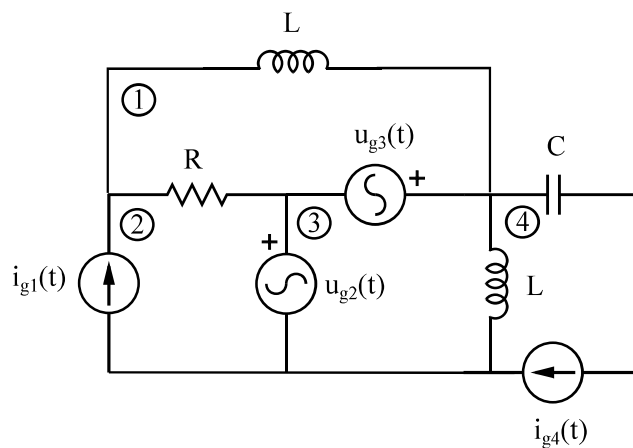
AC circuits

Given that the values of the parameters are $R = 4$, $L = 0.1H$, $C = 25mF$

$$i_{g1}(t) = \sqrt{2} \cdot 10 \cdot \cos 10t\, A \qquad\qquad u_{g2}(t) = \sqrt{2} \cdot 2 \cdot \cos(10t + 90)A$$

$$u_{g3}(t) = \sqrt{2} \cdot 15 \cdot \cos 10t\, V \qquad\qquad i_{g4}(t) = \sqrt{2} \cdot \cos(10t - 90)A$$

a) Write the mesh equations of the circuit.(Label the mesh currents with the names provided in the figure and take the mesh currents in clockwise direction). (3.5 points)

b) Solve the equations and find the mesh currents (write phasors mesh currents below) (2.5 points)

c) Do a power balance of the circuit and write a summary of your results below. (4 points)