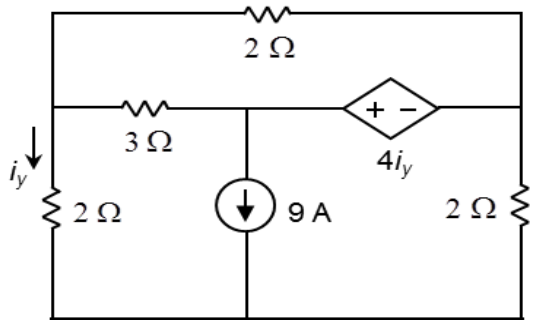
METU/EEED
EE 201

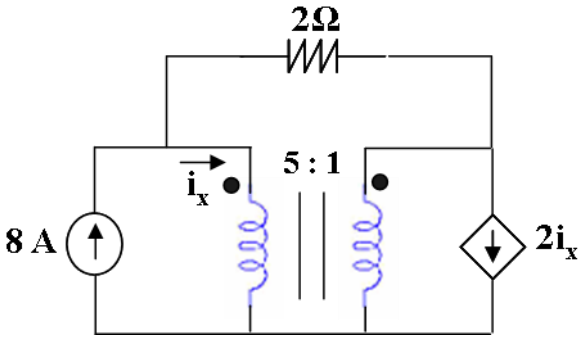
HOMEWORK III

Question 1 Consider the following circuit.

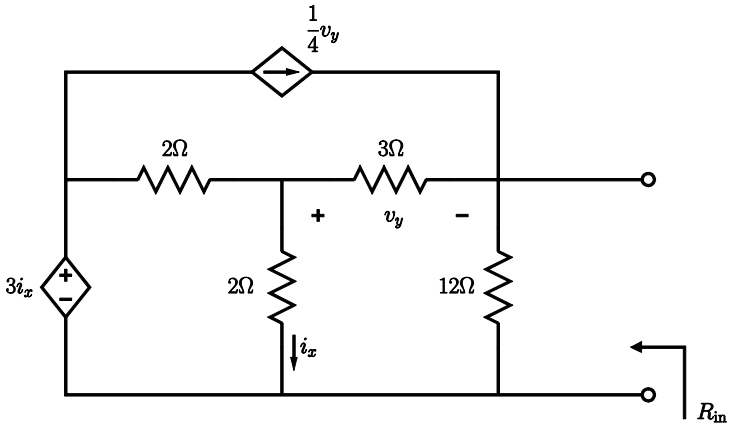


a) Obtain the node equation in matrix form.
b) Solve the node equation, and determine the branch voltages and currents.
c) Obtain the mesh equation in matrix form.
d) Solve the mesh equation, and determine the branch currents and voltages.
e) Determine the powers delivered to/supplied by the branches.
Verify that the power is conserved.

Question 2 For the circuit below, determine the powers delivered to/supplied by each element and verify that the power is conserved.

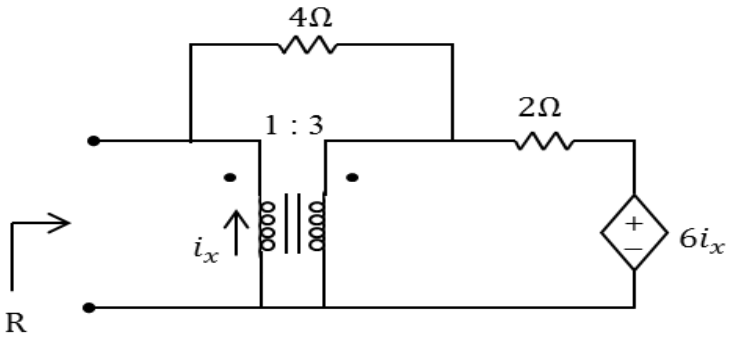


Question 3 Find the input resistance R_{in} of the one-port circuit below.



Answer $R_{in} = 3\ \Omega$.

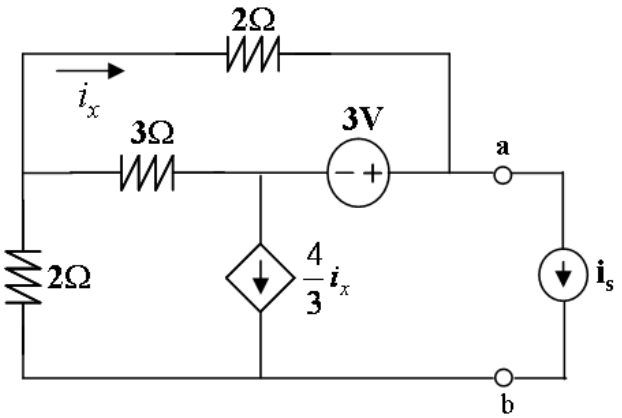
Question 4 Find the input resistance R of the one-port circuit below.



Answer $R = -0.8\ \Omega$.

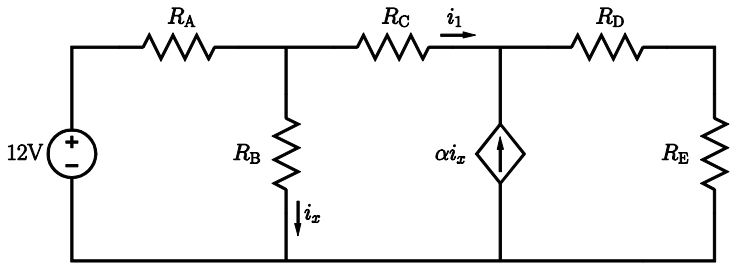
Question 5 Consider the circuit below.

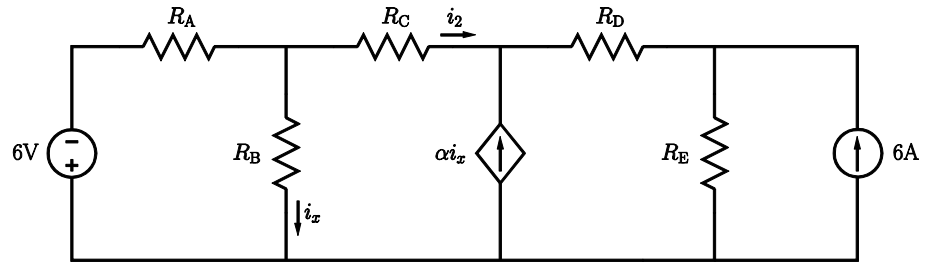
a) Obtain the Thevenin equivalent on the left side of a - b terminals.
b) Determine the set of i_s values so that the independent current source absorbs power.

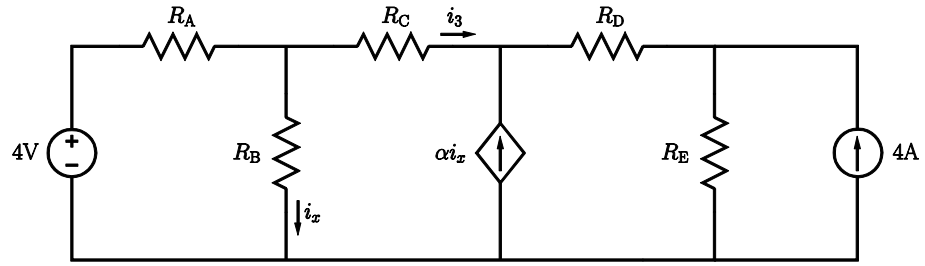


Answer (b) $0 < i_s < 7/8$ A.

Question 6 Consider the three circuits below.

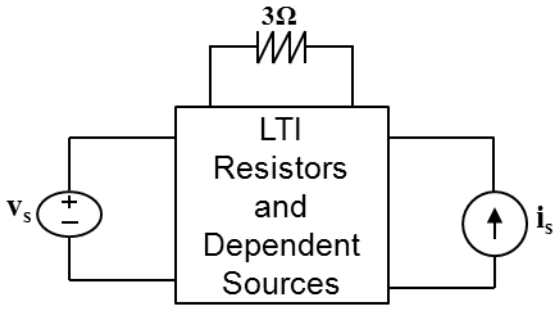






Express i_3 in terms of i_1 and i_2.

Question 7 In the following circuit, the instantenous power delivered to the 3Ω resistor is denoted by $P_{3\Omega}$.



It is known that

i) for $v_s = 4$ V and $i_s = 12$ A, $P_{3\Omega}$ is 0,
ii) for $v_s = 1$ V and $i_s = -9$ A, $P_{3\Omega}$ is 12 W.

What is $P_{3\Omega}$ for $v_s = 5$ V and $i_s = 5$ A?

<u>Answer</u> $P_{3\Omega} = 25/3$ *W.*