UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER I
SESSION 2009/10

SUBJECT'S NAME	:	ELECTRICAL CIRCUIT THEORY
SUBJECT'S CODE	:	BEE 1113
COURSE	:	1 BEE
EXAMINATION DATE	:	NOVEMBER 2009
DURATION	:	3 HOURS
INSTRUCTION	:	**PART A** ANSWER **ALL** QUESTIONS **PART B** ANSWER **FOUR (4)** QUESTIONS ONLY

THIS QUESTION PAPER CONSISTS OF FIFTEEN (15) PAGES

PART A – Question 1 to Question 4 (60 marks)

Q1 (a) A good practice in circuit analysis is to satisfy the power check. This approach will confirm the data being analysed is mathematically correct.

(i) Define the meaning of power check in circuit analysis.

(3 marks)

(ii) Does the circuit in Figure Q1(a)(ii) satisfy the power check? Justify your answer.

(5 marks)

(b) Referring to circuit in Figure Q1(b),

(i) Determine the voltage v_y as a function of V_s.

(5 marks)

(ii) Find voltage v_y given $V_s = 40\text{V}$.

(2 marks)

Q2 Given the value of all components in Figure Q2 as $R_1 = 100\Omega$, $R_2 = 100\Omega$, $R_3 = 50\Omega$ and $v_s(t) = 30 - 24u(t)V$.

(a) Determine $i(t)$ for $t > 0$.

(8 marks)

(b) Calculate the voltage drop at resistor R_2 at $t = 3$.

(4 marks)

Q3 Both capacitor and inductor are known as the storage elements due to its capability to store energy when connected to the power supply. One of the main differences between them is the form of energy stored in each element.

(a) Explain the form of stored energy in capacitor and inductor.

(4 marks)

(b) Given the value of equivalent capacitance, C_{eq}, in Figure Q3(b) is 4μF, determine the value of capacitance C.

(8 marks)

(c) Suppose you are given five capacitors of equal capacitance value. Propose a method to connect all those capacitors in order to increase the total capacitance. Give **ONE (1)** reason for your answer.

(3 marks)

Q4 (a) Find the Thevenin equivalent circuit looking from terminals a – b for the circuit in Figure Q4(a).

(6 marks)

(b) An analysis of circuit in Figure Q4(b) indicates that the mesh currents are $i_1 = 3A$, $i_2 = 2A$, and $i_3 = 4A$. Prove that this analysis is correct.

(12 marks)

PART B – Question 5 to Question 10 (40 marks)

Q5 An electroplating bath, as shown in Figure Q5, is to plate tin uniformly on top of a coin. Suppose an electrolysis process produces a current of 200 A flows for 5 minutes and it is known that each coulomb transports x miligrams of tin. It is found that there are 300 grams of tin deposited on top of the coin at the end of the process.

(a) Determine the value of x in milligrams per coulomb.

(6 marks)

(b) Suppose that each coulomb is able to transport 1.783 miligrams of copper in the same electrolytic process, calculate the total weight of copper deposited.

(4 marks)

Q6 Referring to the circuit in Figure Q6,

(a) Find the value of the load resistor R_L so that maximum power can be delivered to it.

(5 marks)

(b) Calculate the maximum power at R_L.

(5 marks)

Q7 Referring to the circuit in Figure Q7,

(a) Find the values for i, v_C and i_L after they have been connected to the 15 V dc supply for a very long time.

(6 marks)

(b) Calculate the energy stored in the capacitor and inductor.

(4 marks)

Q8 Suppose a continuous capacitor charger system is given as in Figure Q8,

(a) Determine the expression of capacitor voltage for t > 0.

(8 mark)

(b) What will happen to the initial capacitor voltage if the 1kΩ resistor is accidentally shorted? Give **ONE (1)** reason for your answer.

(2 marks)

Q9 Using nodal analysis for circuit in Figure Q9,

(a) Calculate all node voltages.

(7 marks)

(b) Determine the power generated by the dependent source.

(3 marks)

Q10 Referring to the circuit in Figure Q10,

(a) Determine the expression of inductor current, $i_L(t)$, for t > 0.

(7 marks)

(b) Find the inductor current when t = 2.

(3 marks)

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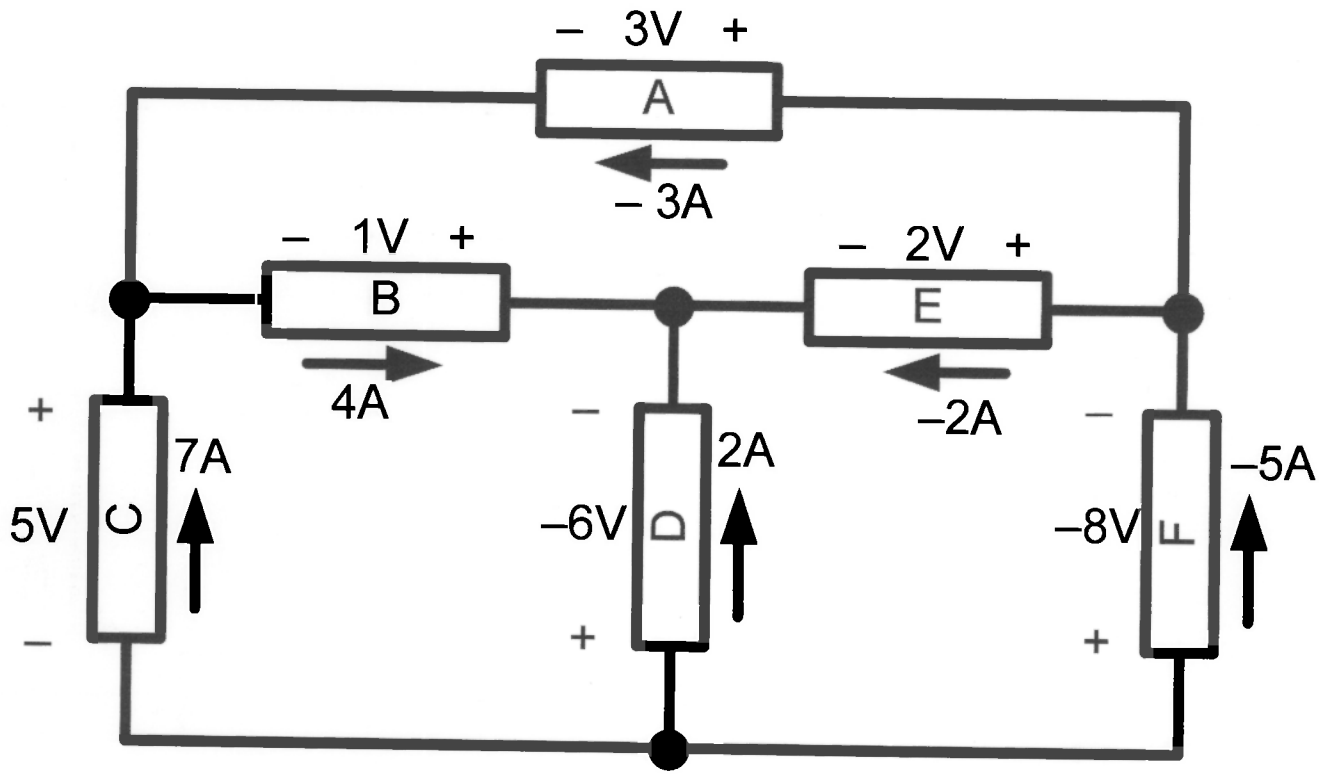

Figure O1(a)(ii)

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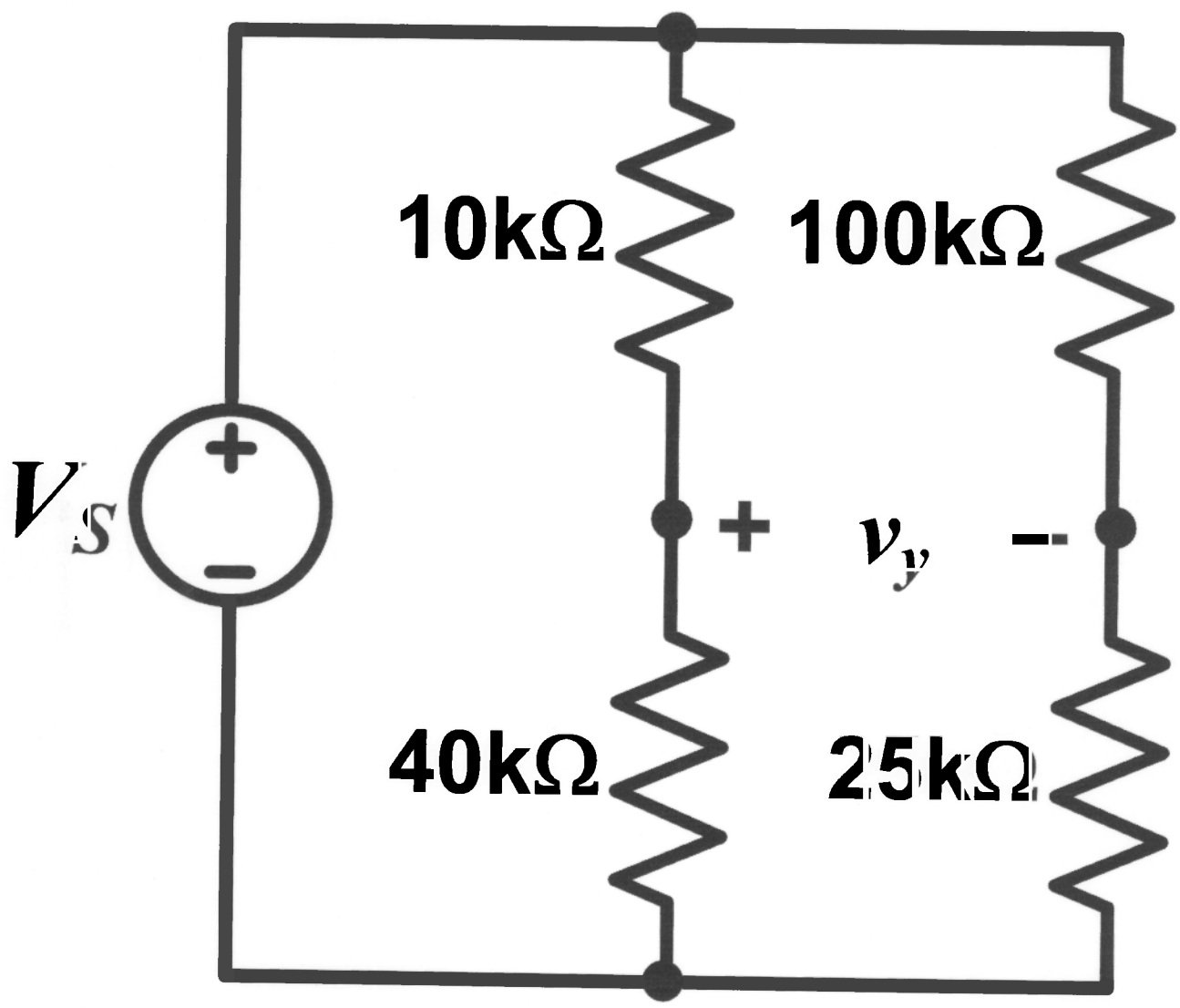

Figure O1(b)

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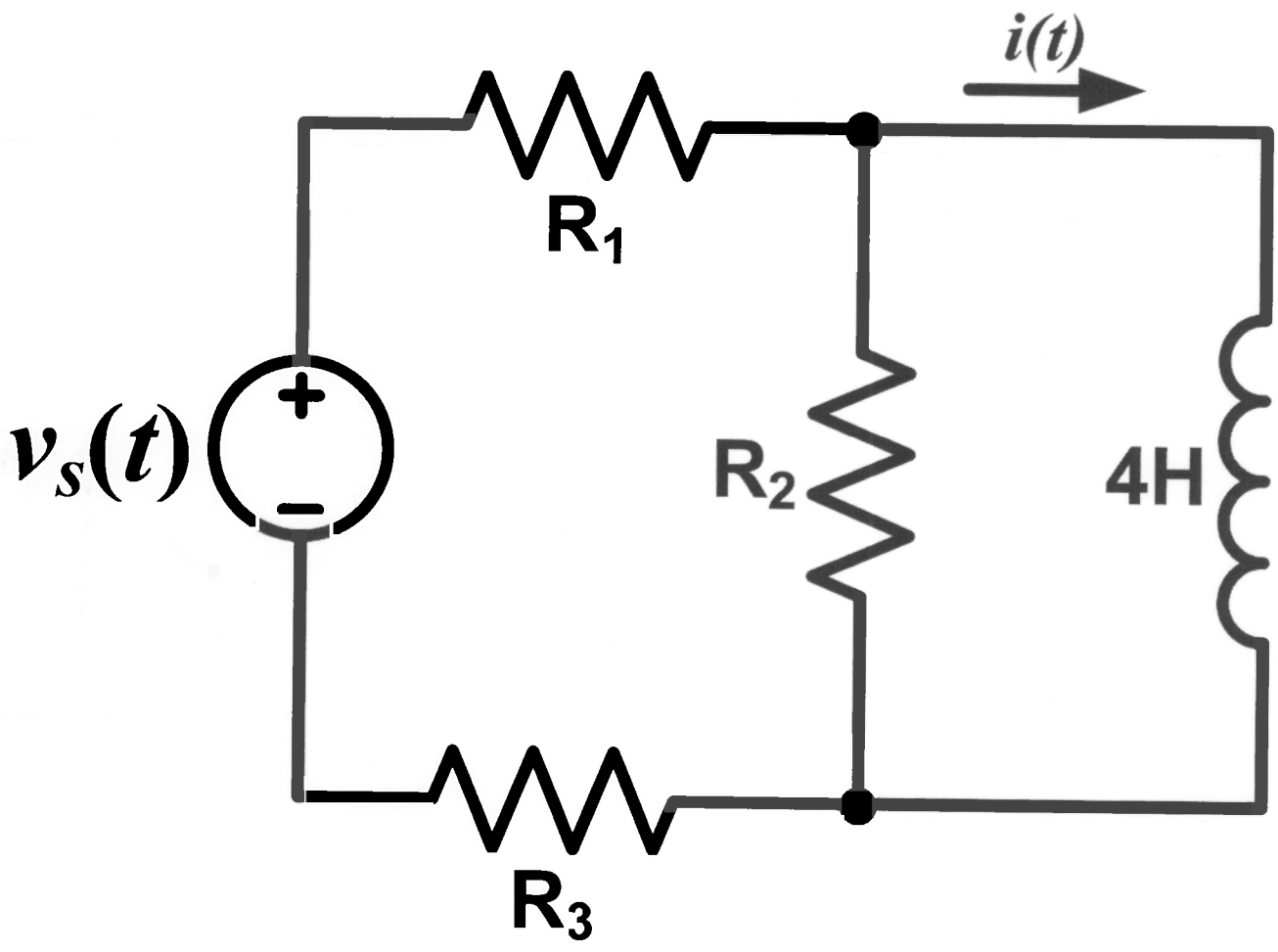

Figure O2

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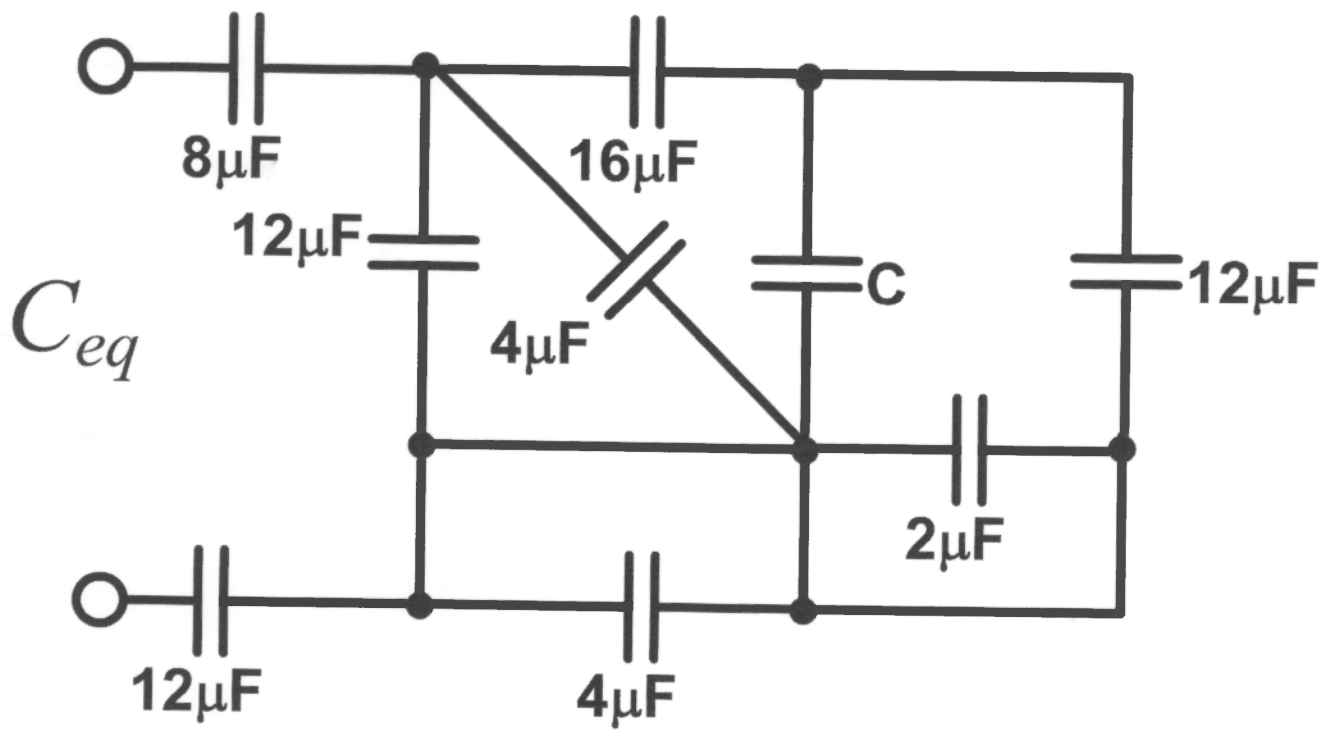

Figure O3(b)

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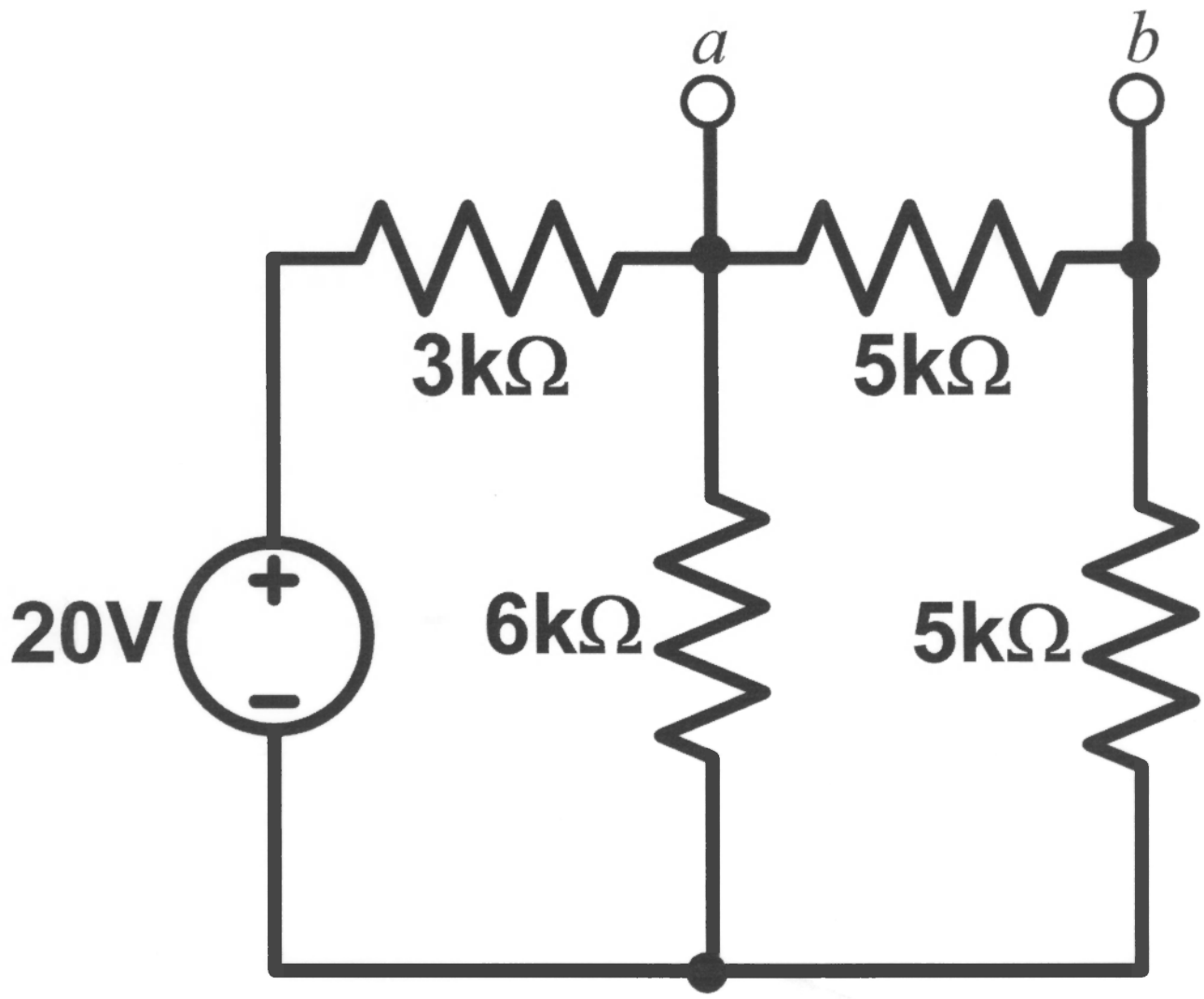

Figure Q4(a)

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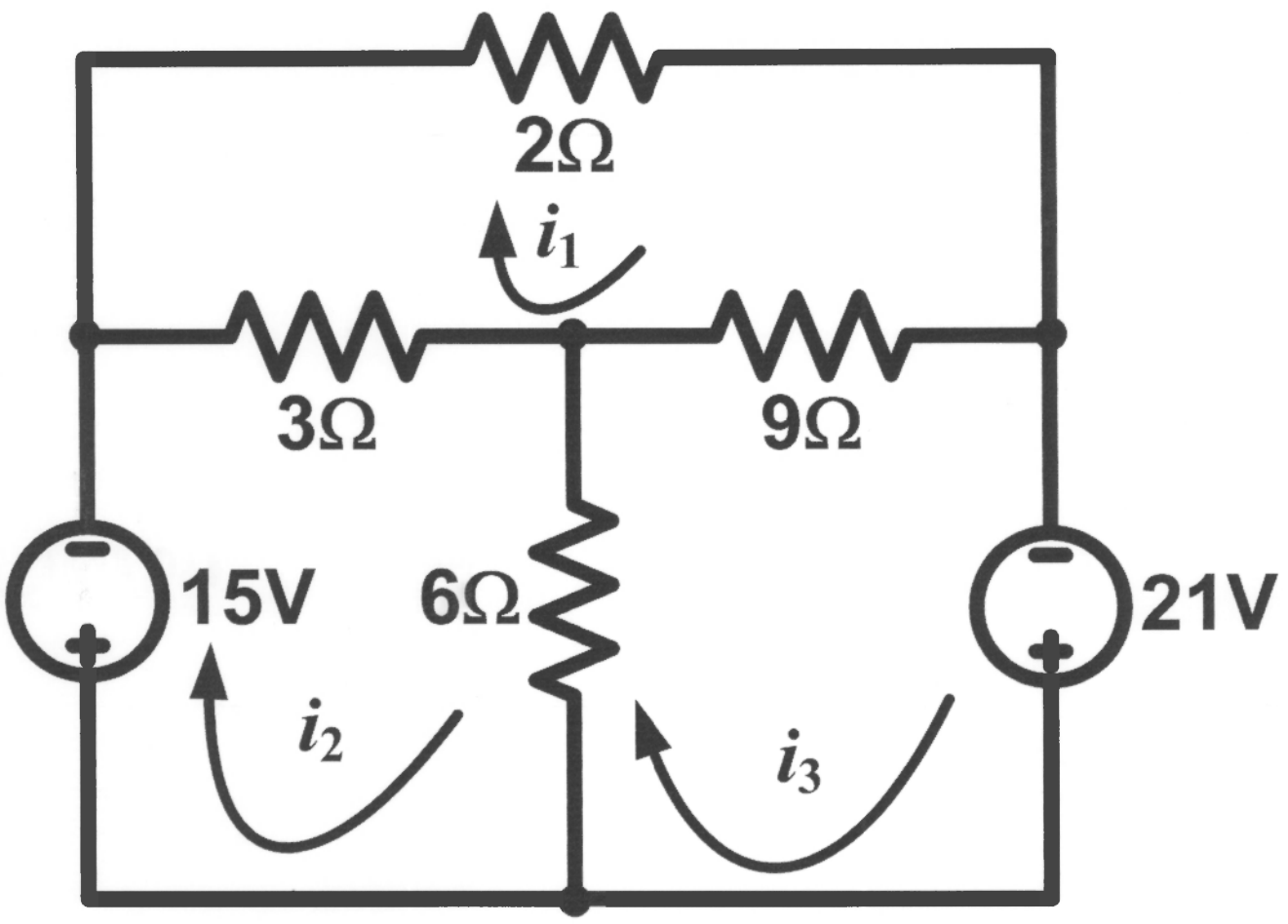

Figure Q4(b)

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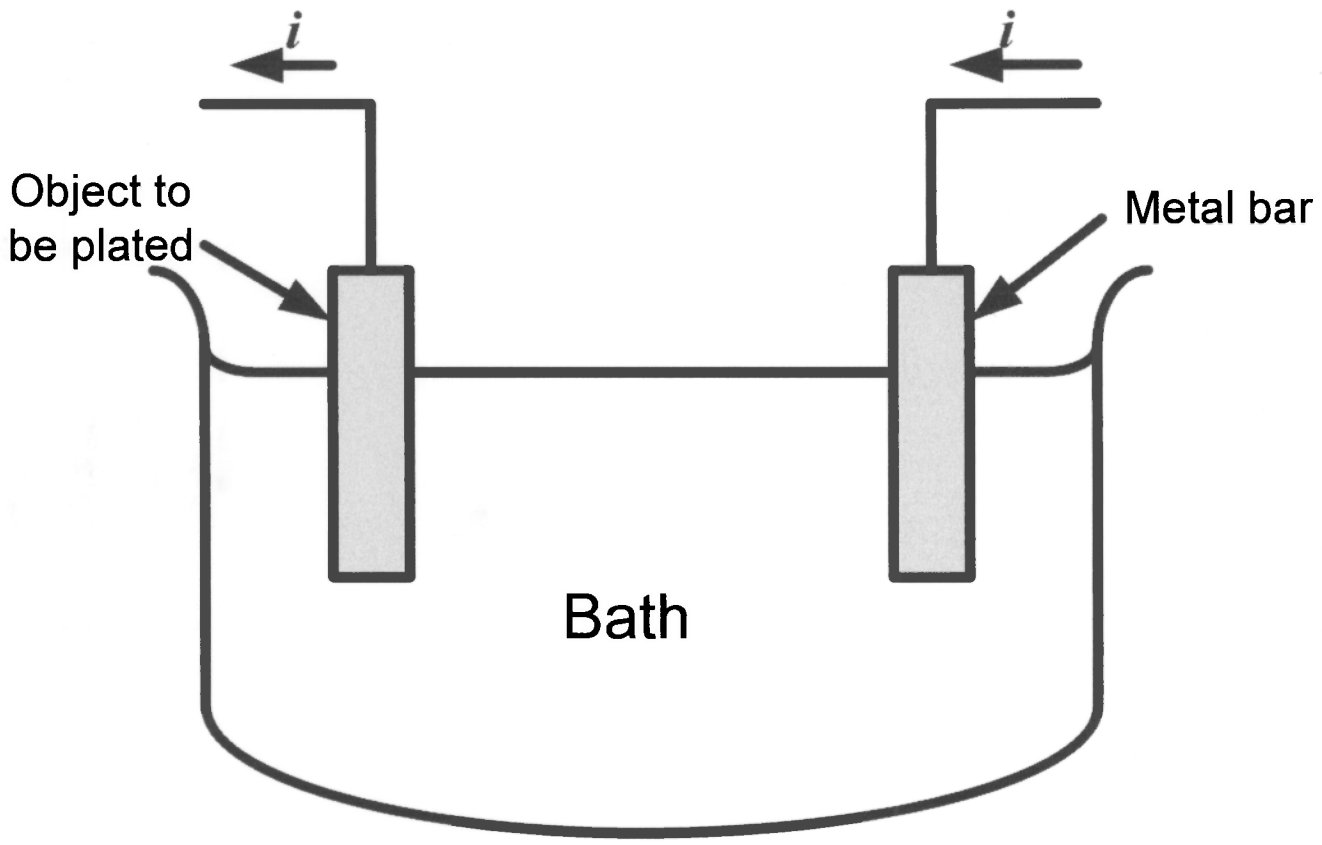

Figure Q5

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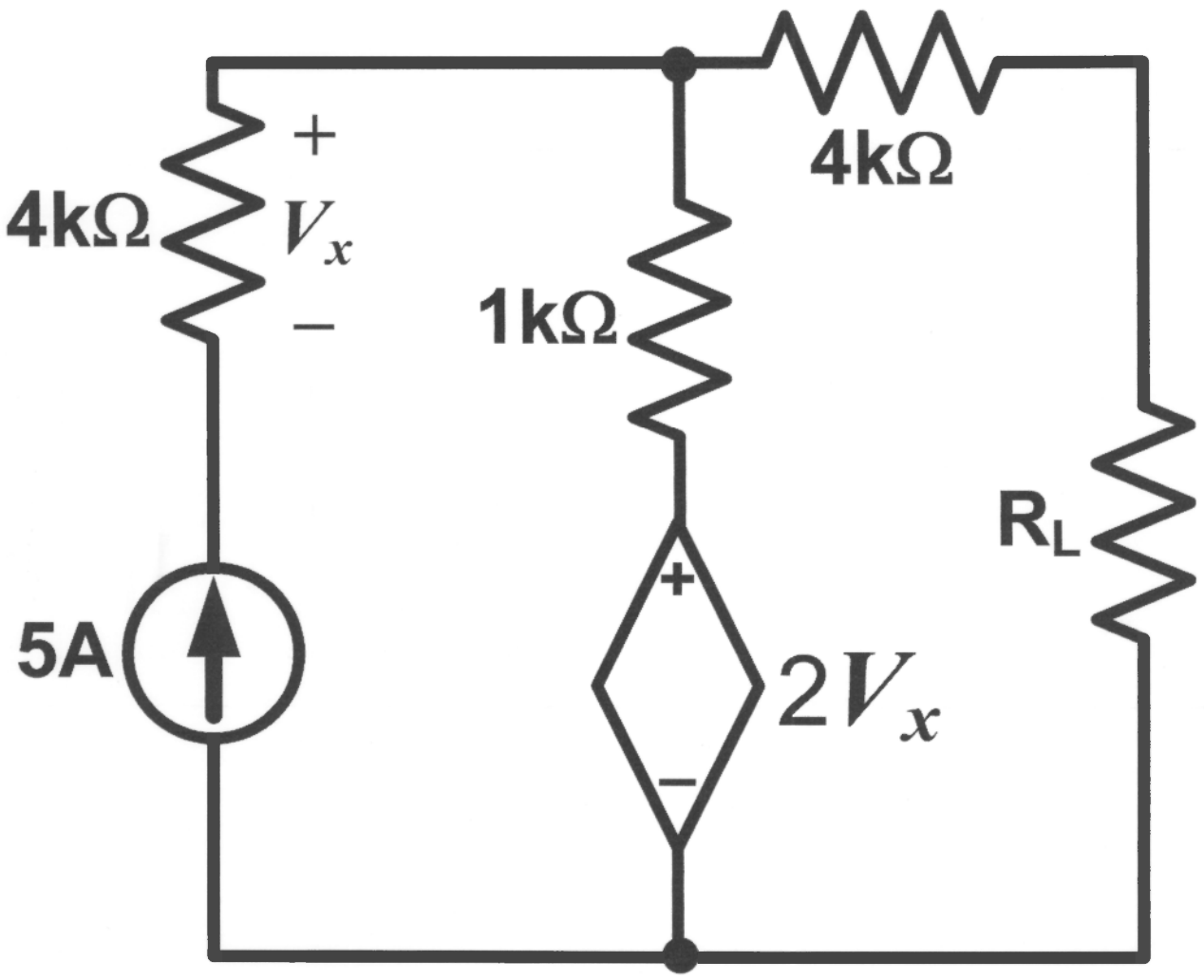

Figure Q6

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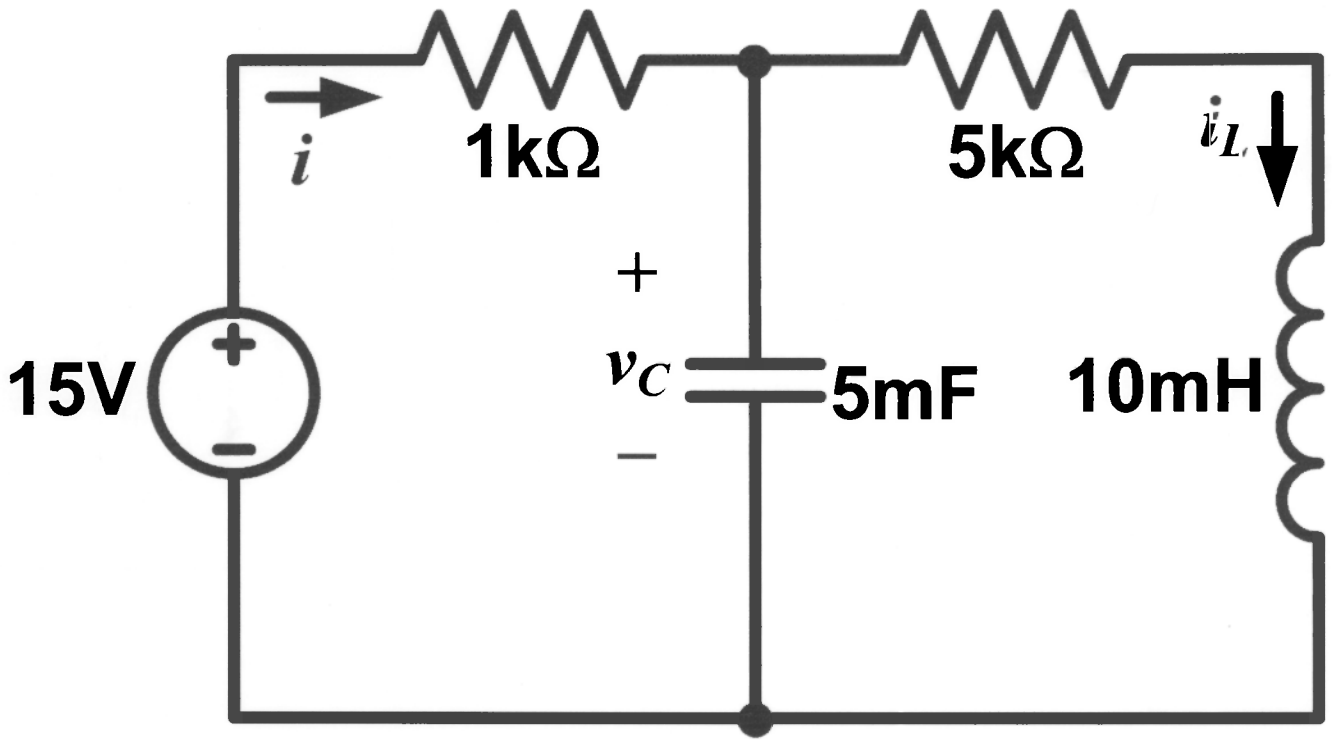

Figure Q7

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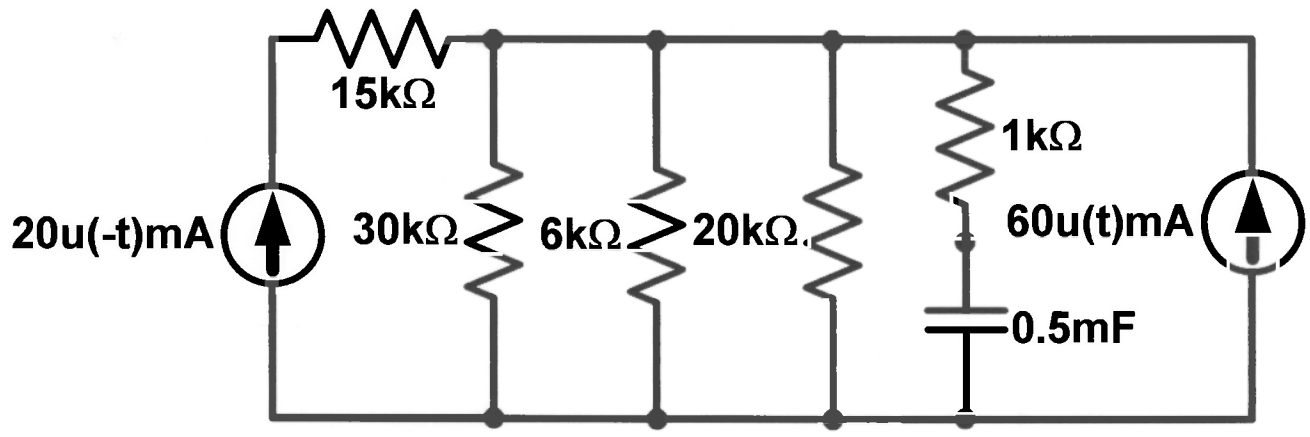

Figure Q8

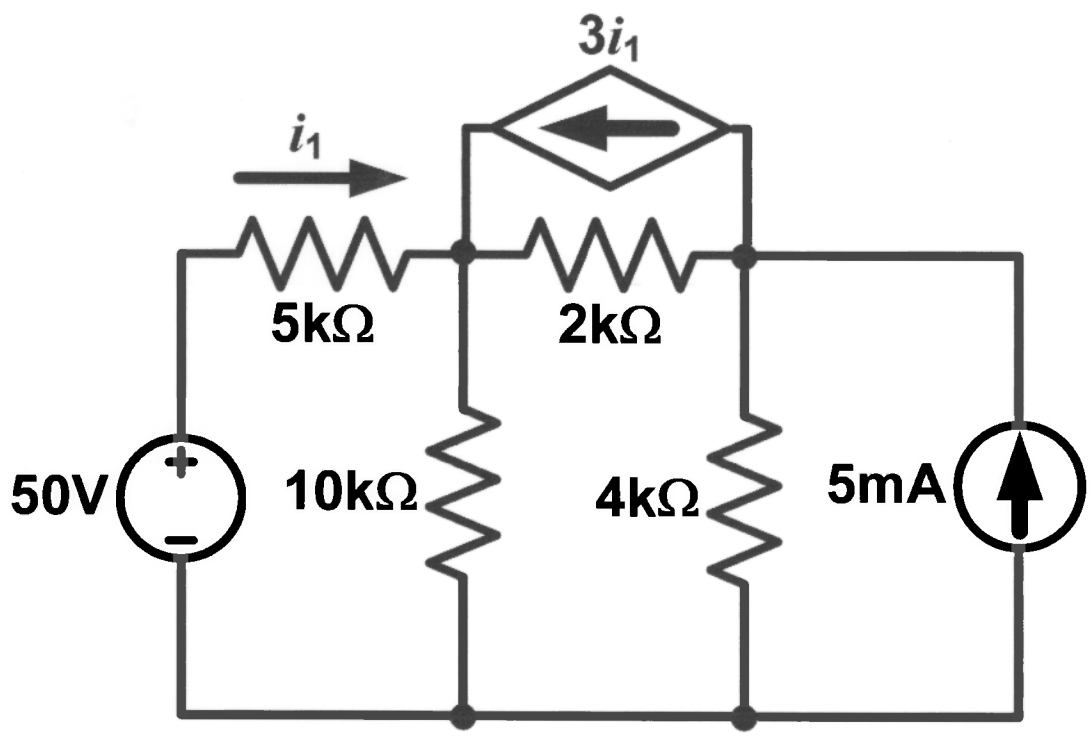

Figure Q9

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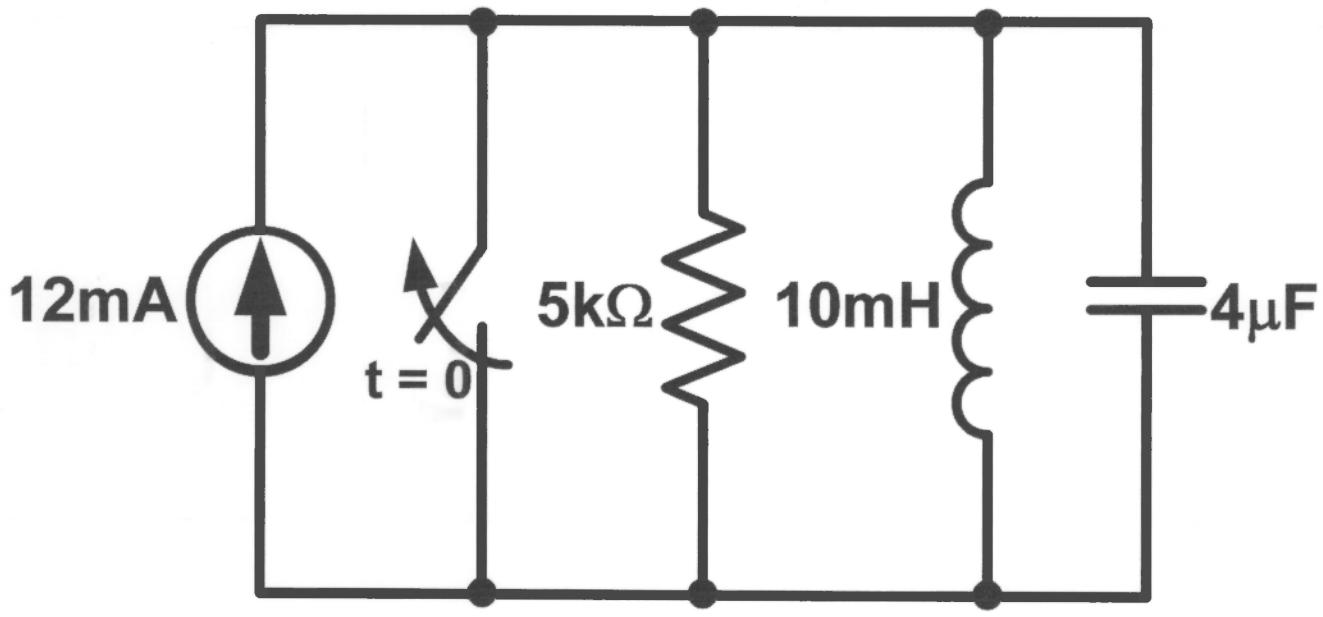

Figure Q10