UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER I
SESSION 2010/2011

COURSE	:	ELECTRIC CIRCUITS
COURSE CODE	:	BEL 10103/BEE 1113
PROGRAMME	:	1 BEU/BED/BEB/BEC/BEH/BEE
EXAMINATION DATE	:	NOVEMBER/DECEMBER 2010
DURATION	:	3 HOURS
INSTRUCTION	:	ANSWER **FIVE (5)** QUESTIONS ONLY

THIS PAPER CONSIST OF TEN (10) PAGES

Q1 (a) Define the electrical terms listed below:

(i) Current

(ii) Voltage

(2 marks)

(b) For the circuit shown in Figure Q1(a):

(i) Describe which elements are in series connection and which elements are in parallel connection.

(ii) Describe the corresponding branches that formed independent loop and dependent loop.

(5 marks)

(c) If the voltage across an element is 8V and the current, I entering the positive terminal is as shown in Figure Q1(b):

(i) Solve for the power delivered to the element at t = 7 ms.

(ii) Solve for the total charge and total energy delivered to the element between 0 to 10 ms.

(8 marks)

(d) For the circuit given by Figure Q1 (c), calculate:

(i) The current flow through the 30 Ω resistor.

(ii) The voltage drop across 16 Ω resistor.

(5 marks)

Q2 (a) Define the Kirchhoff's Current Law and Kirchhoff's Voltage Law.

(2 marks)

(b) Describe and give an example on planar and nonplanar circuit.

(5 marks)

(c) By using mesh analysis, solve for the current through each resistor in Figure Q2 (a).

(8 marks)

(d) Calculate the voltage at each node in Figure Q2 (b) by using nodal analysis and Cramer's rule.

(5 marks)

Q3 (a) Define the superposition theorem.

(2 marks)

(b) With your own words, explain on Thevenin's Theorem and Norton's Theorem.

(5 marks)

(c) Solve for Thevenin's and Norton's equivalent circuit of Figure Q3 (a) by using source transformation.

(8 marks)

(d) From Figure Q3 (b), deduce the relationship between voltage, V_o and current, I_o of resistor R by using Thevenin's Theorem.

(5 marks)

Q4 (a) State the difference between capacitor and resistor in terms of its energy characteristic.

(2 marks)

(b) With your own words, explain and state the equation of an equivalent capacitance for series and parallel capacitors.

(5 marks)

(c) Voltage waveform in Figure Q4 (a) is applied across a 400μF capacitor.

(i) Demonstrate the mathematical equation for the voltage waveform.

(ii) Use answers in Q4 (c) (i) in order to find the current that flows via the capacitor.

(iii) Illustrate the current waveform of the capacitor.

(8 marks)

(d) If the voltage across a 4 H inductor is given by:

$$v(t) = \begin{cases} 40t^2 \text{ V} & t > 0\text{s} \\ 0 \text{ V} & t < 0\text{s} \end{cases}$$

(i) Calculate the current through the inductor.

(ii) Calculate the power of the inductor.

(iii) Calculate the energy stored within $0 < t < 7$ s.

(5 marks)

Q5 (a) List down two (2) ways of supplying energy to the first order circuit.

(2marks)

(b) Explain briefly on singularity functions.

(5 marks)

(c) The switch in the circuit shown in Figure Q5 (a) has been closed for a long time and it is opened at t = 0 s. Solve for:

(i) the initial voltage, $v(0)$.
(ii) the initial energy stored in the capacitor.
(iii) the time constant for the circuit.
(iv) the expression of $v(t)$ for t > 0.

(8 marks)

(d) The switch in the circuit shown in Figure Q5 (b) remained connected to the 40V source for a long time. At t = 0 the switch was moved to the 100V supply. Calculate the initial value $i(0^-)$ and final value $i(\infty)$ of the inductor current $i(t)$.

(5 marks)

Q6 (a) Define the meaning of second order circuit.

(8 marks)

(b) Explain on the solution of natural responses for source free series RLC circuit.

(5 marks)

(c) For the circuit shown in Figure Q6 (a), solve for $v(t)$ when t > 0 s.

(8 marks)

(d) Conclude the general steps involved in order to determine the step response of a second order circuit.

(5 marks)

Q7 (a) Define the meaning of phasors.

(2 marks)

(b) Describe the voltage and current relationship of passive elements in time and phasors domain.

(5 marks)

(c) For the circuit of Figure Q7 (a), use mesh analysis to find the mesh currents i_1 and i_2. Let $v_1 = 10 \cos 4t$ V and $v_2 = 20 \cos (4t - 30°)$ V.

(8 marks)

(d) Determine the value of i_1 in the circuit of Figure Q7 (b)

(5 marks)

FINAL EXAMINATION

SEMESTER/SESSION : SEMESTER I/ SESSION 2010/2011
COURSE : ELECTRIC CIRCUITS

PROGRAMME : 1BEU/BED/BEB/BEC/BEH/BEE
COURSE CODE : BEL 10103 / BEE 1113

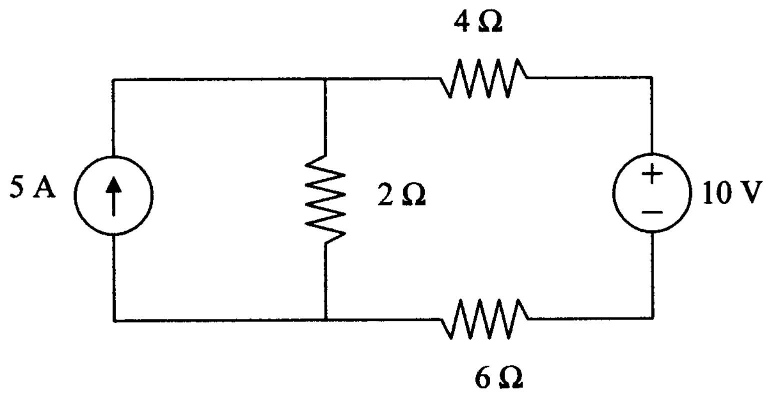

Figure Q1 (a)

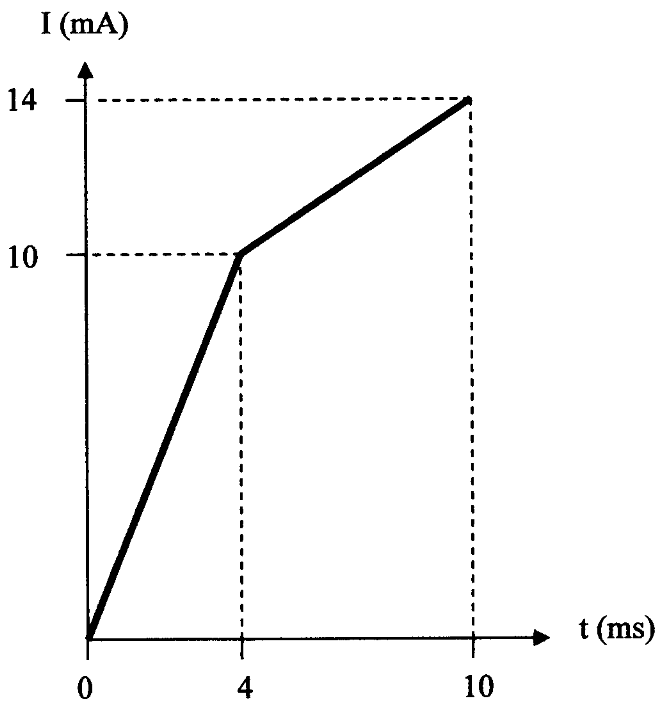

Figure Q1 (b)

FINAL EXAMINATION

SEMESTER/SESSION : SEMESTER I/ SESSION 2010/2011 PROGRAMME : 1BEU/BED/BEB/BEC/BEH/BEE
COURSE : ELECTRIC CIRCUITS COURSE CODE : BEL 10103 / BEE 1113

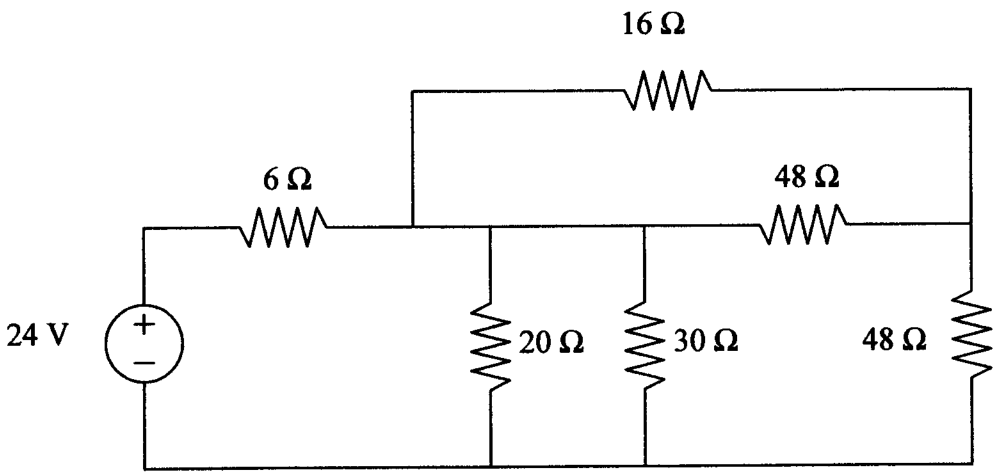

Figure Q1 (c)

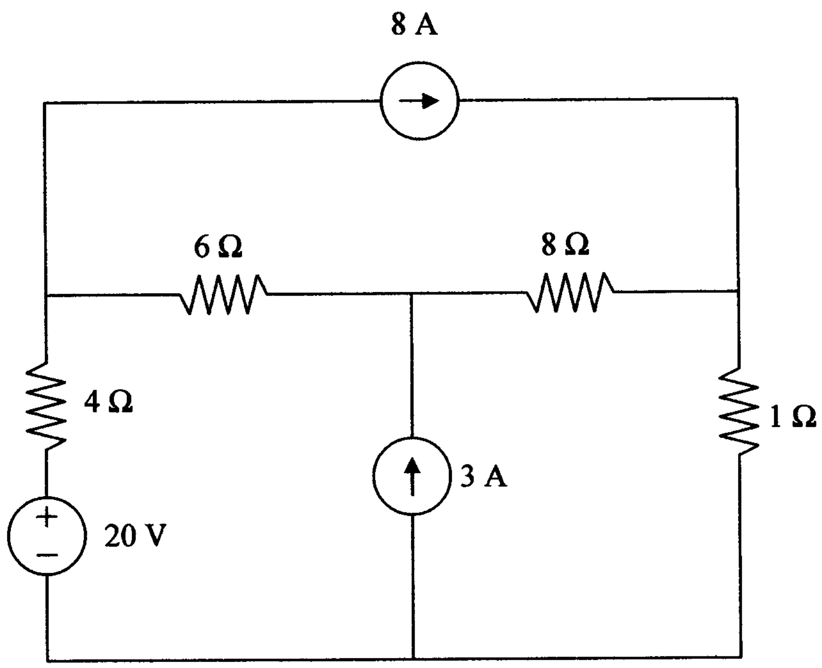

Figure Q2 (a)

FINAL EXAMINATION

SEMESTER/SESSION : SEMESTER I/ SESSION 2010/2011 PROGRAMME : 1BEU/BED/BEB/BEC/BEH/BEE
COURSE : ELECTRIC CIRCUITS COURSE CODE : BEL 10103 / BEE 1113

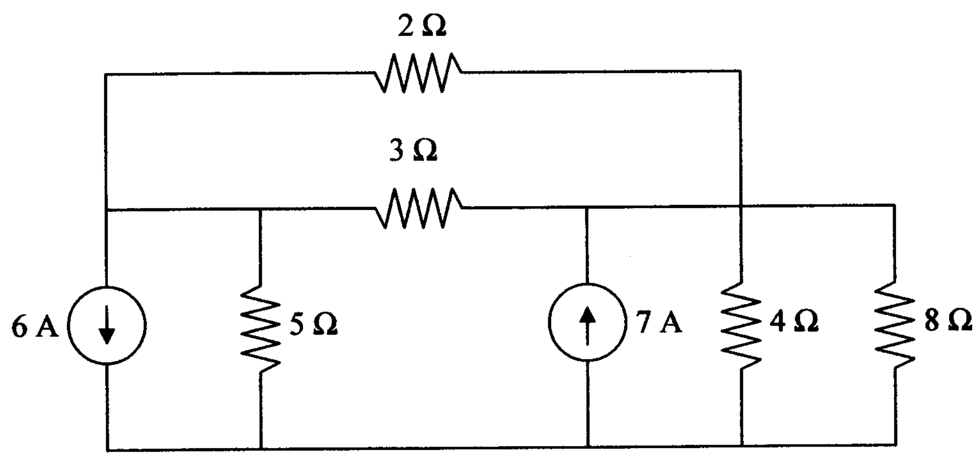

Figure Q2 (b)

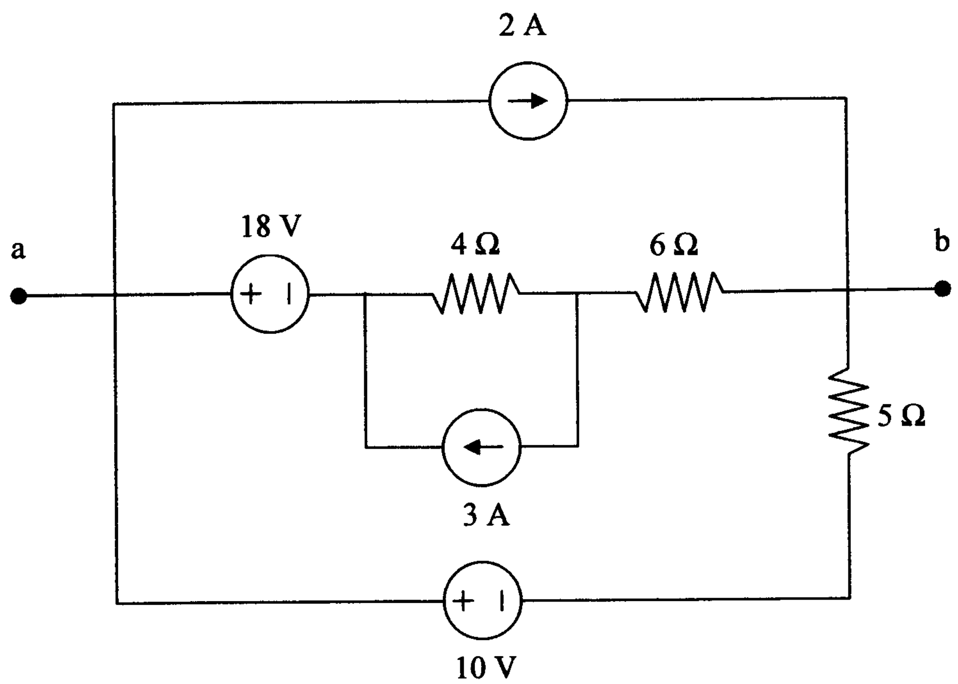

Figure Q3 (a)

FINAL EXAMINATION

SEMESTER/SESSION : SEMESTER I/ SESSION 2010/2011
COURSE : ELECTRIC CIRCUITS
PROGRAMME : 1BEU/BED/BEB/BEC/BEH/BEE
COURSE CODE : BEL 10103 / BEE 1113

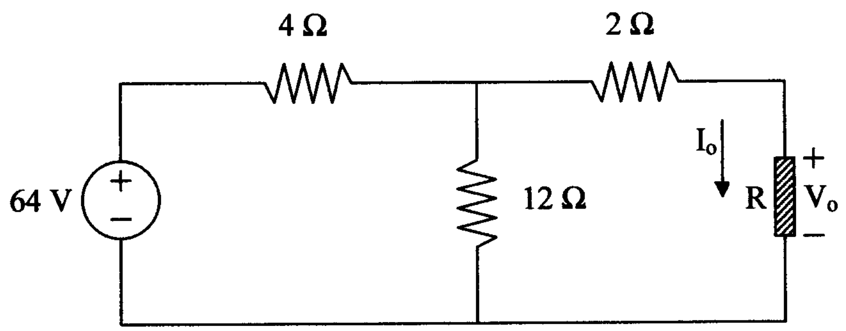

Figure Q3 (b)

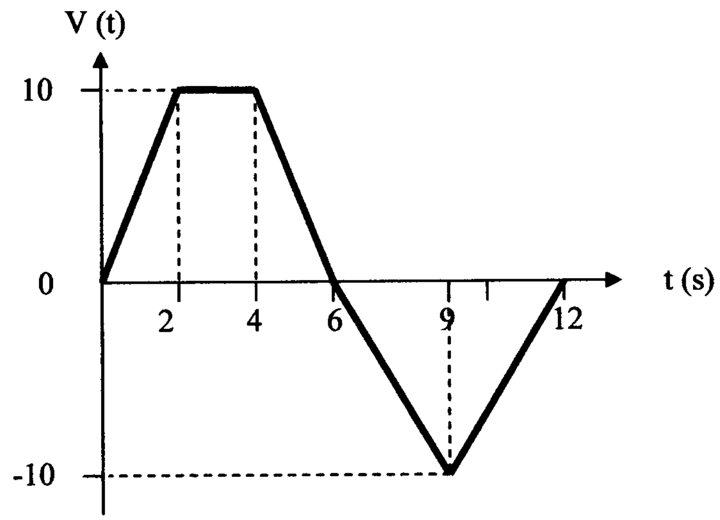

Figure Q4 (a)

FINAL EXAMINATION

SEMESTER/SESSION : SEMESTER I/ SESSION 2010/2011 PROGRAMME : 1BEU/BED/BEB/BEC/BEH/BEE
COURSE : ELECTRIC CIRCUITS COURSE CODE : BEL 10103 / BEE 1113

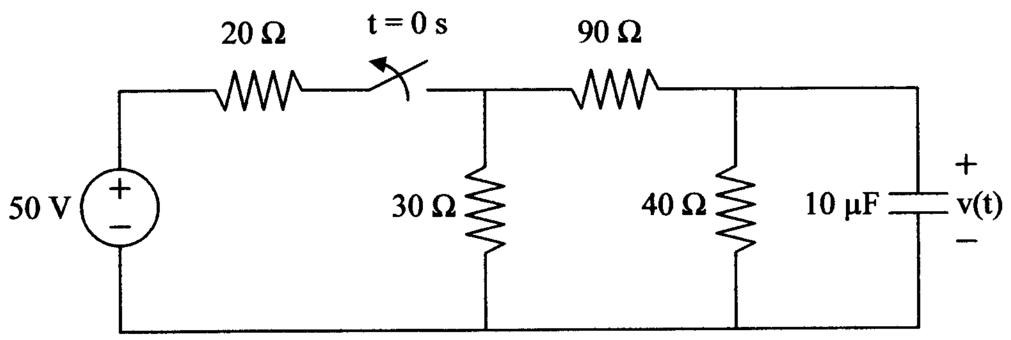

Figure Q5 (a)

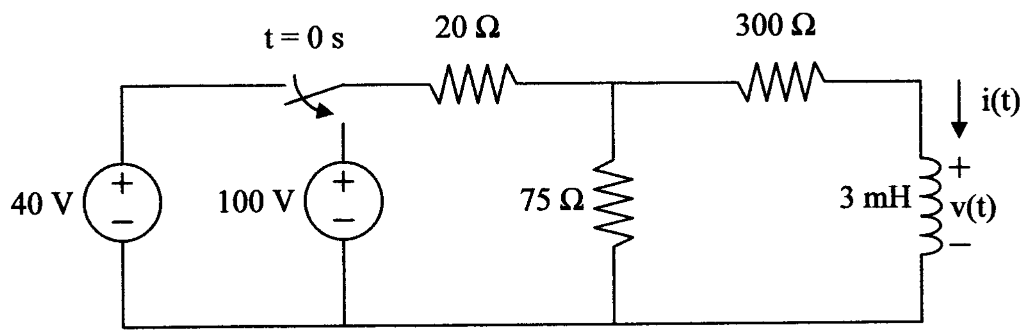

Figure Q5 (b)

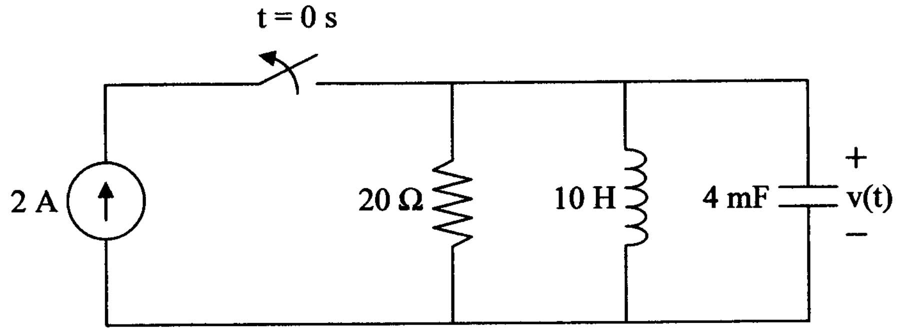

Figure Q6 (a)

FINAL EXAMINATION

SEMESTER/SESSION : SEMESTER I/ SESSION 2010/2011 PROGRAMME : 1BEU/BED/BEB/BEC/BEH/BEE
COURSE : ELECTRIC CIRCUITS COURSE CODE : BEL 10103 / BEE 1113

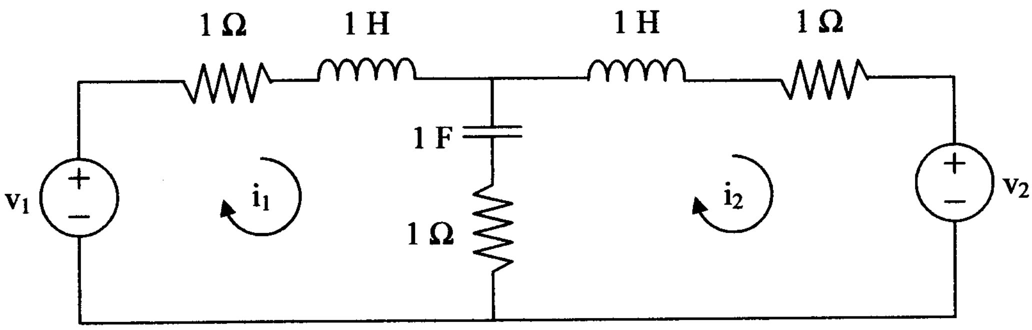

Figure Q7 (a)

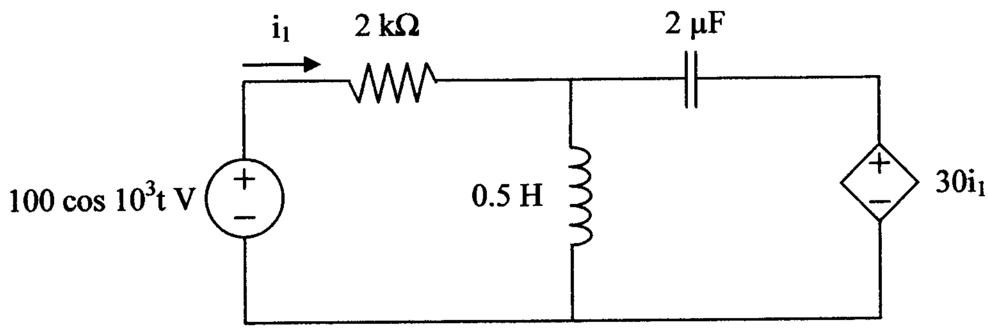

Figure Q7 (b)