INTI
INTERNATIONAL COLLEGE PENANG (507232-U)
LAUREATE INTERNATIONAL UNIVERSITIES

FINAL
Examination Paper

(COVER PAGE)

Session : APRIL 2013

Programme : DIPLOMA IN ELECTRICAL AND ELECTRONIC ENGINEERING

Course : EEE 1101: BASIC ELECTRICAL TECHNOLOGY

Date of Examination : 1 August 2013

Time : 5p.m. – 7p.m. Reading Time : Nil

Duration : 2 Hours

Special Instructions :

This paper consists of **SIX (6)** questions. Answer any **FOUR (4)** questions in the answer booklet provided. All questions carry equal marks.

Materials permitted :

Non-Programmable Scientific Calculator

Materials provided :

Examiner(s) : **Shalyn Lim Sheue Hui**

Moderator : **Chan Tse Wei**

This paper consists of 9 printed pages, including the cover page.

INTI INTERNATIONAL COLLEGE PENANG

DIPLOMA IN ELECTRONIC AND ELECTRICAL ENGINEERING PROGRAMME (DEEI)

DIPLOMA IN ENGINEERING PROGRAMME

EEE 1101: BASIC ELECTRICAL TECHNOLOGY
FINAL EXAMINATION: APRIL 2013 SESSION

Instructions: This paper consists of SIX (6) questions. Answer any FOUR (4) questions in the answer booklet provided. All questions carry equal marks.

Question 1

(a) A loudspeaker is connected to an amplifier as shown in Figure Q1 (a). If a 10Ω loudspeaker draws a maximum power of 12 W from the amplifier, determine the maximum power a 4Ω loudspeaker will draw. Consider the voltage source is constant.

(3 marks)

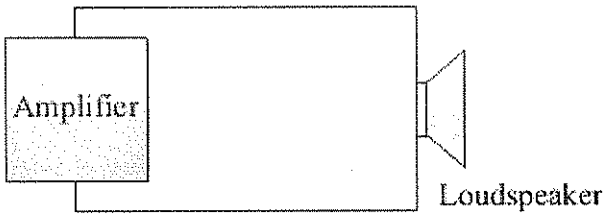


Figure Q1(a)

(b) A wire-wound resistor is made from a 250 m length of copper wire having a circular cross-section of diameter 0.5 mm. Given that the wire has a resistivity of 0.018 μΩ m, calculate its resistance value.

(4 marks)

(c) With reference to Figure Q1(c),calculate

(i) The total resistance.

(4 marks)

(ii) the currents I_1, I_2, and I_3.

(7 marks)

(iii) the voltage V.

(3 marks)

(iv) the power dissipated through 10kΩ and 12kΩ.

(4 marks)

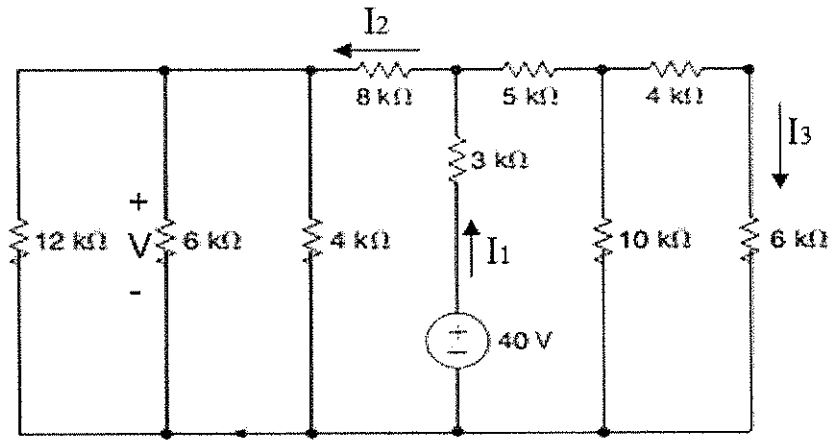


Figure Q1(c)

Question 2

(a) Determine the voltage, V_x in Figure Q2 (a) using superposition theorem

(7 marks)

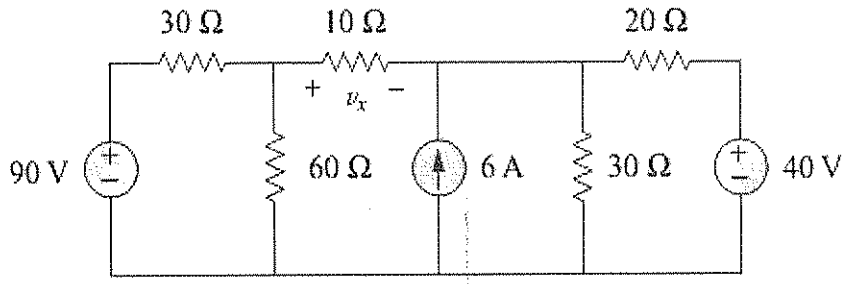


Figure Q2(a)

(b) For the circuit shown in Figure Q2(b),using nodal analysis to determine

(i) V_1 and V_2 .

(4 marks)

(ii) Power dissipated through 4Ω.

(2 marks)

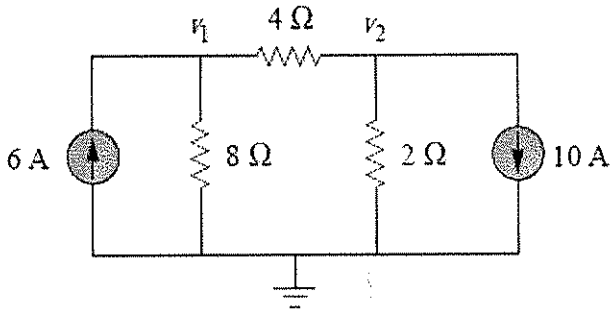


Figure Q2(b)

(c) Apply Thevenin's theorem to find the voltage, V_o in the circuit of Figure Q2(c).

(7 marks)

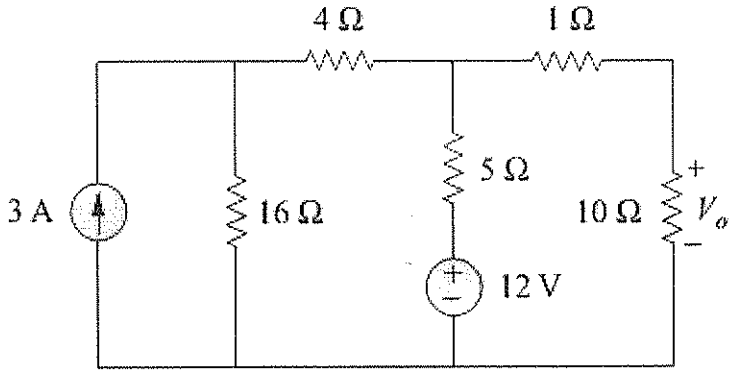


Figure Q2(c)

(d) Refer to the circuit in Figure Q2 (d), calculate the voltage, V using star –delta transformation.

(5 marks)

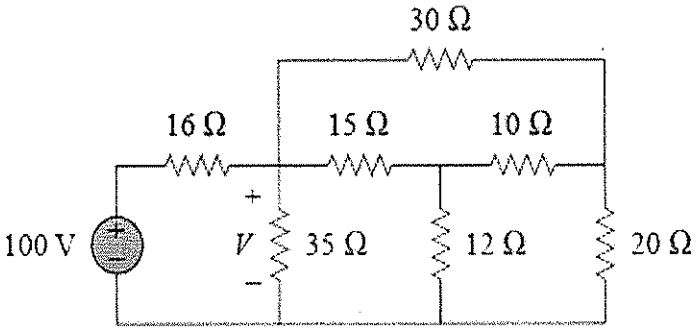


Figure Q2(d)

Question 3

(a) Define Magnetizing force and provide the equation with unit stated.

(3 marks)

(b) A first coil with 400 turns is wound onto a cast steel toroid having an effective length of 25 cm and cross sectional area of 4.5 cm^2. Given the steel has a relative permeability of 180 under the operating conditions. a second coil of 650 turns is wound over the first, and the current through coil 1is changed from 2 A to 0.5 A in a time of 3 ms. If 95% of the flux thus produced links with coil 2, calculate

(i) the self-inductances of the first coil,L_1 and the second coil L_2 respectively.

(6 marks)

(ii) the mutual inductance.

(2 marks)

(iii) the self-induced emf in the first coil.

(2 marks)

(iv) the mutually induced emf in the second coil

(3 marks)

(c) A steel toroid of the dimensions shown in Figure Q3(c) is wound with a 500 turns coil of wire. What value of current needs to be passed through this coil in order to produce a flux of 250 μWb in the toroid, if under these conditions the relative permeability of the toroid is 300? What will happen to the total reluctance and total flux developed if there is an air gap in the steel toroid?

(9 marks)

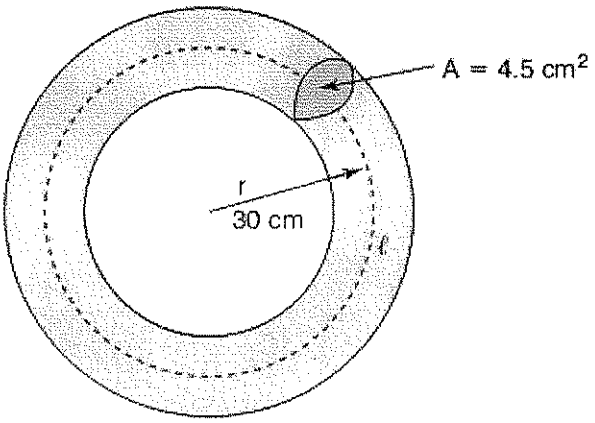


Figure Q3(c)

Question 4

(a) Refer to Figure Q4(a), differentiate and explain graph A,B and C where *i* is the current flowing through an inductor.

(3 marks)

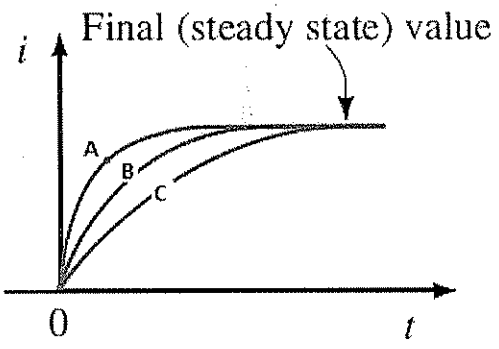


Figure Q4(a)

(b) Refer to the network in Figure Q4(b), the switch is closed at t = 0 s.

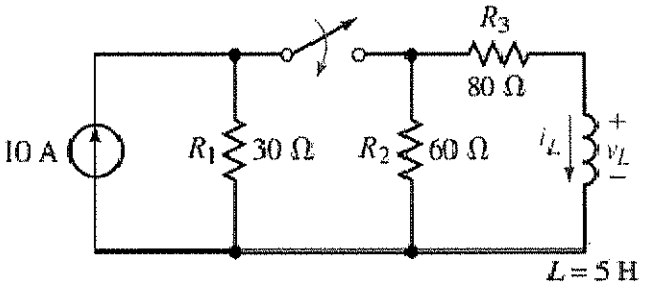


Figure Q4(a)

(i) Write the mathematic expressions for i_L and v_L when the switch is closed for t>0s.
(6 marks)

(ii) At t=300ms the switch is opened. Write the mathematic expressions for i_L and v_L during decay phase.
(5 marks)

(iii) Determine the values for i_L and v_L at t=100ms and 350ms respectively.
(5 marks)

(c) Two parallel-plate capacitors *A* and *B* are connected in series across a 500 V dc supply. *A* has a capacitance of 250 pF and consists of two flat parallel metal plates each 10 cm x 10 cm separated by a dielectric 1.5 mm thick. Calculate the

(i) relative permittivity of the dielectric of *A*
(2 marks)

(ii) capacitance of *B* if the electric field strength in *A* is 100 kV/m
(4 marks)

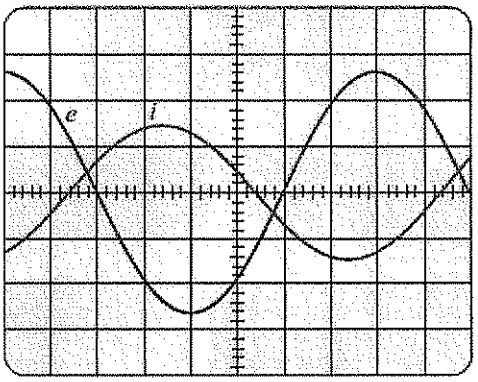
Question 5

(a) A circuit consists of a 10μF capacitor connected in series with a 25 kΩ resistor with a switchable 100 V d.c. supply. When the supply is connected at t = 0s, calculate

(i) the voltage across the capacitor after 0.5 s.
(3 marks)

(ii) the time for the capacitor voltage to reach 45 V
(3 marks)

(b) For the oscilloscope display in Figure Q5(b),determine the



Vertical sensitivity = 0.5 V/div.
Horizontal sensitivity = 1 ms/div.

Figure Q5(b)

(i) frequency of waveform ***i***.

(2 marks)

(ii) rms value for waveform ***e***.

(2 marks)

(iii) phase shift between the two waveforms and determine which signal is leading.

(2 marks)

(c) Refer to the AC network in Figure Q5(c).

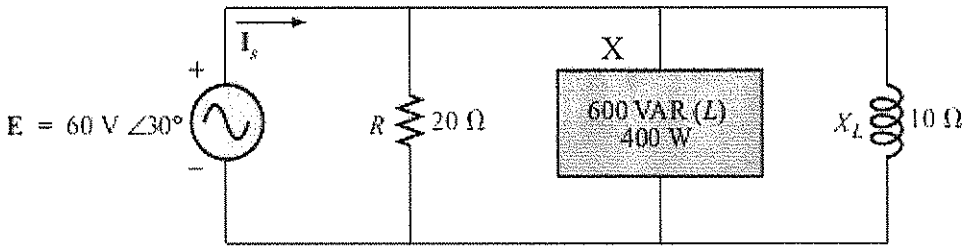


Figure Q5(c)

(i) Calculate the total average, reactive, and apparent power for the overall network.

(8 marks)

(ii) Refer to the answers obtained in part (i), determine the power factor.

(2 marks)

(iii) Find the current Is.
[express the answers in polar form]

(3 marks)

Question 6

(a) For the network shown in Figure Q6(a), calculate
[express the answers in polar form]

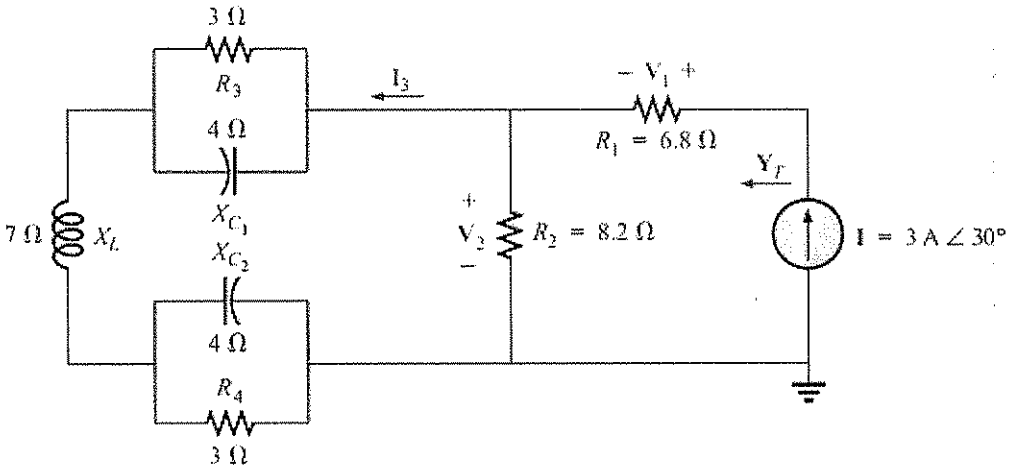


Figure Q6(a)

(i) the total impedance, Z.

(6 marks)

(ii) the total admitance, Y.

(2 marks)

(iii) voltage V_1 and V_2.

(5 marks)

(iv) current I_3.

(2 marks)

(b) Refer to the resonant network in Figure Q6(b).

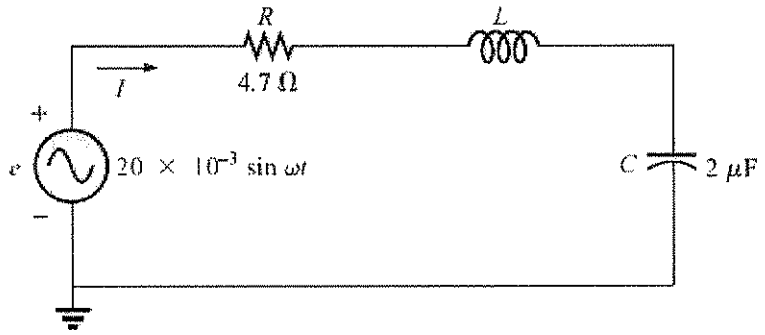


Figure Q6(b)

(i) State two criteria for resonance to happen in Figure Q6(a).

(2 marks)

(ii) Find the value of L if the resonant frequency is 1800 Hz

(2 marks)

(iii) Find the magnitude of the current I_{rms} at resonance

(3 marks)

(iv) Find the Q factor of the network.

(3 marks)

--THE END--

<EEE1101/(F)/APRIL13/ Shalyn Lim 1/4/13>