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

FINAL
Examination Paper

(COVER PAGE)

Session : AUGUST 2012

Programme : DIPLOMA IN ELECTRICAL AND ELECTRONIC ENGINEERING

Course : EEE 1101: BASIC ELECTRICAL TECHNOLOGY

Date of Examination : 11 December 2012

Time : 8.30a.m. – 10.30a.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 : **Steven Khoo**

This paper consists of 8 printed pages, including the cover page.

INTI INTERNATIONAL COLLEGE PENANG

DIPLOMA IN ELECTRONIC AND ELECTRICAL ENGINEERING PROGRAMME (DEEI)

EEE 1101: BASIC ELECTRICAL TECHNOLOGY
FINAL EXAMINATION: AUGUST 2012 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) Define resistivity and state two physical characteristics that determine the resistance of a conductor.

(3 marks)

(b) An electric heater develops a power of 1kW where run on 230 V supply. If the resistance wire of the heater has diameter of 0.5mm and resistivity of 60 x 10^{-8} Ωm, find the length of the wire.

(4 marks)

(c) Refering to Figure Q1(c),determine

(i) the total resistance, R_T.

(3 marks)

(ii) the V_A and I_o.

(5 marks)

(iii) the total power,P_T dissipated from the circuit.

(2 marks)

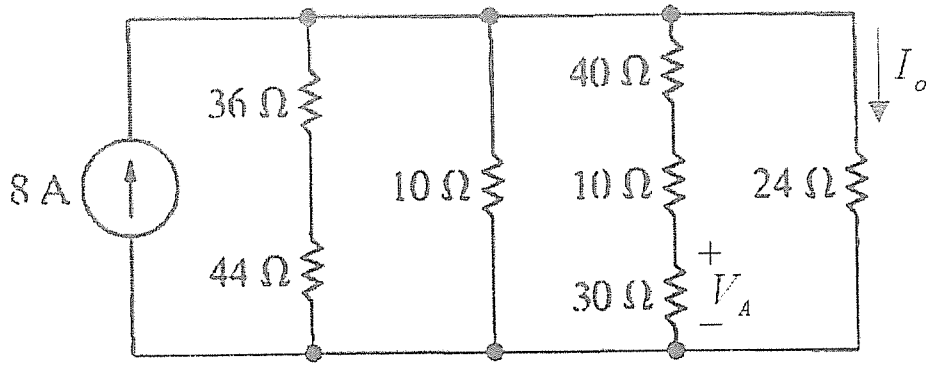


Figure Q1(c)

(d) Two resistors R_1 and R_2 are connected in series across a battery of emf 12 V. If R_1 has a value of 16 Ω and it dissipates a power of 4 W,

(i) calculate the total current,I.

(2 marks)

(ii) calculate the value of R_2.

(3 marks)

(iii) if R_1 and R_2 are modified to parallel connection across a battery of emf 12V, calculate the new R_2 in order to change the total current in part (i) to 2A.

(3 marks)

Question 2

(a) Compute the current,I in the 23 Ω resistor of Figure Q2(a) by applying

(i) Superposition theorem

(6 marks)

(ii) Thevenin's theorem

(8 marks)

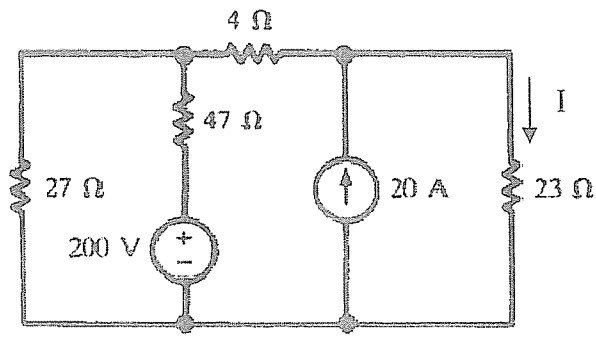


Figure Q2(a)

(b) For the network shown in Figure Q2(b), determine the current I_1 and I_2 .

(5 marks)

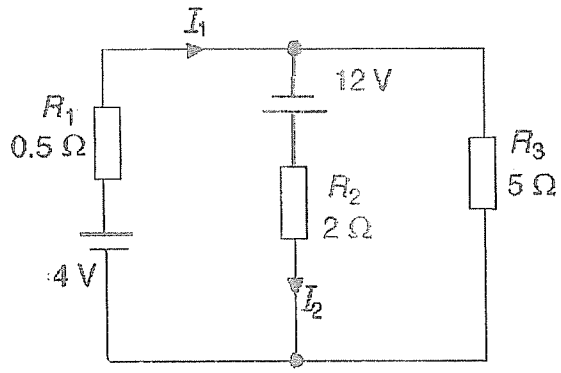


Figure Q2(b)

(c) Using star-delta transformation, calculate I_T and I_{R4} shown in Figure Q2(c).

(6 marks)

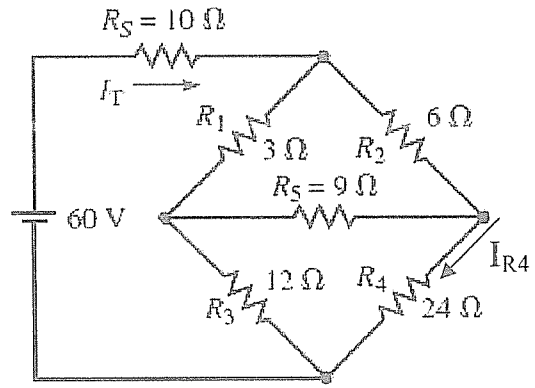


Figure Q2(c)

Question 3

(a) A non-magnetic ring has a mean diameter of 44.5 cm and a cross-sectional area of 12 cm^2. It is uniformly wound with 500 turns with the supply current of 1A. Calculate (given $\mu_o = 4\pi \times 10^{-7}$ Wb/At · m)

(i) the magnetic field strength.

(3 marks)

(ii) the total flux.

(2 marks)

(b) A silicon iron ring is wound with 800 turns, the ring having a mean diameter of 120 mm and a cross-sectional area of 400 mm^2. When carrying a current of 0.5A the relative permeability is found to be 3000, calculate

(i) the self-inductance of the coil.

(3 marks)

(ii) induced e.m.f. if the current is reduced to zero in 80 ms.

(2 marks)

(c) A current of 6A passing through an air-cored coil A of 800 turns produces a magnetic flux of 120μ Wb. When the same current is passed through an air-cored coil B of 1200 turns, the flux produced is 160 μ Wb. Given the coupling coefficient is 0.5, calculate

(i) the inductance of each coil

(3 marks)

(ii) the total inductance when the coils are connected in series cumulatively .

(4 marks)

(d) In the device shown in Figure Q3(d),when the current in the primary coil of 1000 turns increases linearly from 1A to 6A in 200 ms, an e.m.f. of 15V is induced into the secondary coil of 480 turns and turn on the DC motor, calculate

(i) the mutual inductance of the two coils

(2 marks)

(ii) the current produce at secondary coil.

(2 marks)

(iii) the self inductance of secondary coil if the produced flux at secondary coil is 2mWb.

(2 marks)

(iv) power consumption of the motor.

(2 marks)

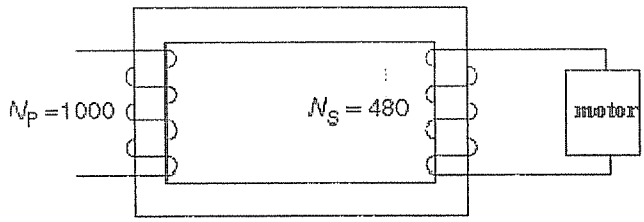


Figure Q3(d)

Question 4

(a) For the network of Figure Q4(a),the switch is closed at t=0s.

(i) Determine the mathematical expressions for the current i_L and the voltage v_L when the switch is closed.

(6 marks)

(ii) Sketch the waveform of i_L with proper labeling.

(2 marks)

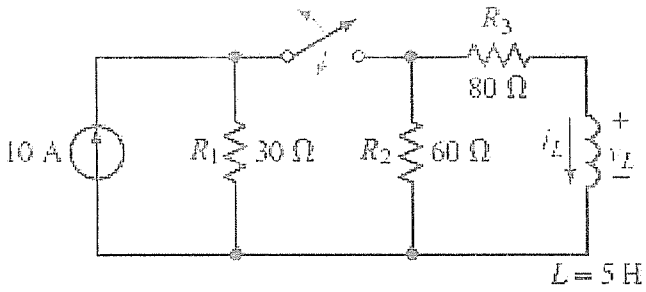


Figure Q4(a)

(b) Two parallel plates separated by a dielectric of thickness 3 mm acquire a charge of 35 mC when connected to a 150 V source. If the cross sectional area of the field between the plates is 144 mm^2 , calculate

(i) the electric field strength

(2 marks)

(ii) the flux density.

(2 marks)

(c) A 3 μ F capacitor is charged from a 250 V d.c. supply. Calculate the charge and energy stored. The charged capacitor is now removed from the supply and connected across an uncharged 6 μF capacitor. Calculate the voltage across the plates and the energy now stored by the combination.

(6 marks)

(d) Refer to Figure Q4(d) ,find the mathematical expression for the transient behavior of the voltage, v_C and the current, i_C following the closing of the switch.

(7 marks)

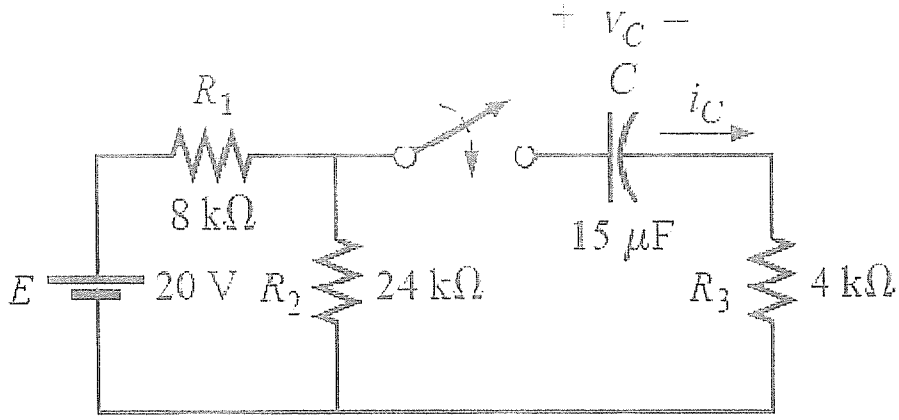


Figure Q4(d)

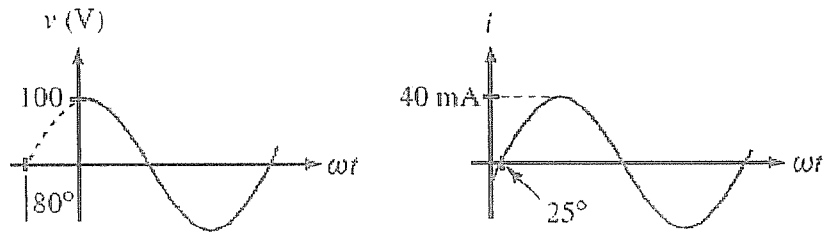
Question 5

(a) Define **phasor** for an alternating quantity.

(2 marks)

(b) Express the voltages and currents of the Figure Q5(b) (i) and (ii) in both the time and the phasor domains. By using the voltages and currents in Figure Q5(b) (i) and (ii) calculate the impedance.

(6 marks)



(i) (ii)

Figure Q5(b)

(c) For the network of Figure Q5(c),calculate
[express the answer in polar form]

(i) the total admittance and total impedance

(6 marks)

(ii) the current of I, I_1,I_2 and I_3. Verify Kirchhoff's Current Law.

(11 marks)

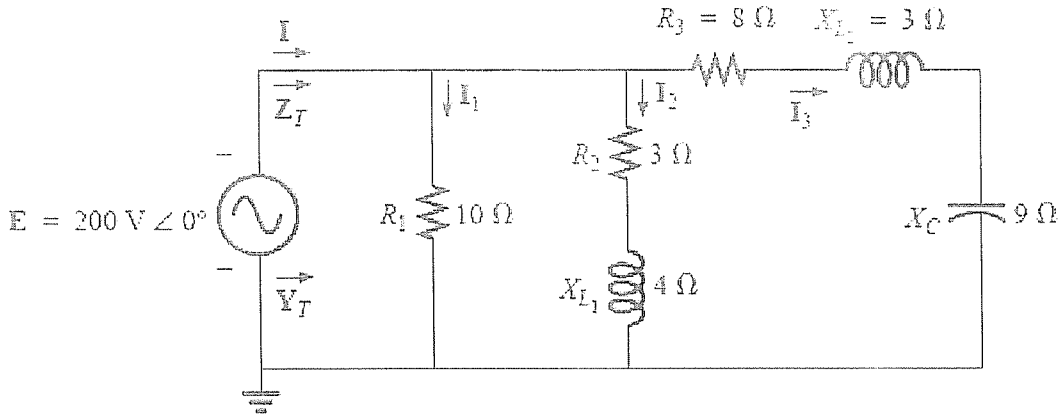


Figure Q5(c)

Question 6

(a) A coil of negligible resistance and inductance 100mH is connected in series with a capacitance of 2 μF and a resistance of 10Ω across a 50V. Determine

(i) the resonant frequency.

(2 marks)

(ii) the voltage across the coil at resonance.

(2 marks)

(iii) the Q-factor of the circuit.

(2 marks)

(b) An electrical load operates at 240 V rms. The load absorbs an average power of 8 kW at a lagging power factor of 0.8. Calculate

(i) the complex power of the load.

(3 marks)

(ii) the impedance of the load.

(5 marks)

(c) 5-hp motor with a 0.6 lagging power factor and an efficiency of 92% is connected to a 208-V, 60-Hz supply.

(i) Establish the power triangle for the load.

(7 marks)

(ii) Determine the power-factor capacitor that must be placed in parallel with the load to raise the power factor to unity.

(4 marks)

--THE END--