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

FINAL
Examination Paper

(COVER PAGE)

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| Session | : | APR 2014 |
| Programme | : | DIPLOMA IN ELECTRICAL AND ELECTRONIC ENGINEERING |
| Course | : | EEE1104: ELECTRICAL MEASUREMENTS AND TRANSMISSION |
| Date of Examination | : | 21 JULY 2014 |
| Time | : | 8.00am – 10.00am 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 :

Nil

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

Moderator : **Kevin Tan**

*This paper consists of _8_ printed pages, including the cover page.*

INTI INTERNATIONAL COLLEGE PENANG
DIPLOMA IN ELECTRICAL AND ELECTRONIC ENGINEERING PROGRAMME (DEEI)

EEE1104: ELECTRICAL MEASUREMENTS AND TRANSMISSION
FINAL EXAMINATION: APRIL 2014 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) With the aid of diagram , explain the principle of operation of attraction type moving iron instrument and with the necessary torques.

(7 marks)

(b) A PMMC instrument has a coil of dimension 10 mm x 8 mm. The flux density in the air gap is 0.15 $Wb/m^2$. The coil is wound for 100 turns and carrying a current of 5mA. Given the spring constant is $0.2 \times 10^{-6}$ Nm/degree.

(i) Calculate the deflection (in degree).

(5 marks)

(ii) If the device is modified to a gravity controlled instrument, the controlling weight is 0.0005 kg and act at a distance of 1.2 cm from the axis of the moving system. Determine the deflection (in degree).

(4 marks)

(c) A 100V range electrodynamic uses spring control. It has initial inductance of 0.5 H and full scale deflecting torque of $0.8 \times 10^{-4}$ Nm. The full scale deflecting torque current is 100mA. Determine the discrepancy (%) between d.c and a.c reading at 100V if the inductance varies uniformly over the full scale of $90^{\circ}$.

(9 marks)

**Question 2**

(a) Refer to Figure Q2(a), derive the equation for shunt ( $R_s$ ) as shown below:

(4 marks)

$$R_S = \frac{I_m R_m}{I - I_m}$$

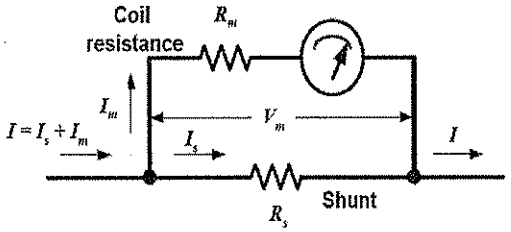


Figure Q2(a)

(b) Design an Ayrton shunt to provide an ammeter with current ranges 1A, 5A, and 10A, if PMMC meter have internal resistance of 50 Ω and full scale current of 1mA.Sketch your design of the meter.

(6 marks)

(c) In Figure Q2(c) , A 10 mA ammeter with a 200 Ω internal resistance is used to measure the current.

(i) Calculate the insertion error (%).

(3 marks)

(ii) Find the suitable meter resistor in order to reduce the insertion error in part (ii) to half.

(3 marks)

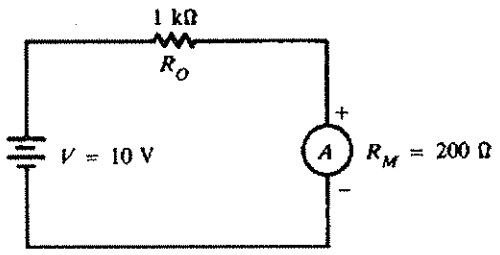


Figure Q2(c)

(d) Refer to Figure Q2(d), the voltmeter range of 10V with sensitivity of 1kΩ/V used to measure the voltage drop across $R_B$. Calculate

(i) the full scale deflection current of the voltmeter.

(1 marks)

(ii) the value of $R_B$.

(6 marks)

(iii) the error in voltmeter reading (%).

(2 marks)

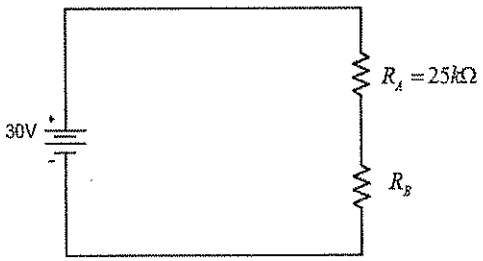


Figure Q2(d)

**Question 3**

(a) Consider the Δ-Y three phase system shown in Figure Q3 (a). The line impedance of 0.1+j0.2Ω is connected to the three phase load. Calculate

(i) the line currents.

(5 marks)

(ii) the load phase voltage for phase **A**.

(3 marks)

(iii) the load line voltage, $\mathbf{V_{CA}}$.

(3 marks)

(iv) the load reactive power per phase.

(4 marks)

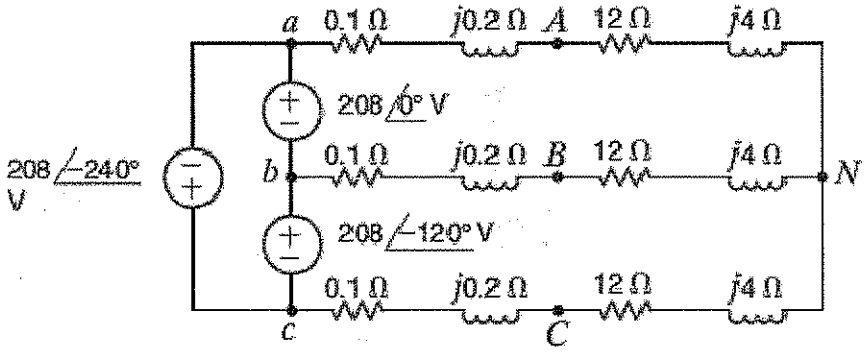


Figure Q3(a)

(b) A three-phase balanced wye–delta system has a line voltage of 208 V. The total real power absorbed by the load is 1200 W. If the power factor angle of the load is 20° lagging, determine and

(i) the magnitude of the line current.

(3 marks)

(ii) the value of the load impedance per phase in the delta ( polar form).

(3 marks)

(ii) the total apparent power and reactive power.

(4 marks)

**Question 4**

(a) Refer to the two ports network shown in Figure Q4(a). Calculate

(i) Z-parameter (in s domain).

(4 marks)

(ii) Transmission parameter (in s domain).

( 3 marks)

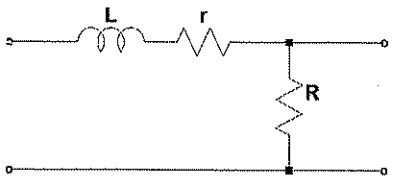


Figure Q4(a)

(b) For the circuit shown in Figure Q4(b),calculate

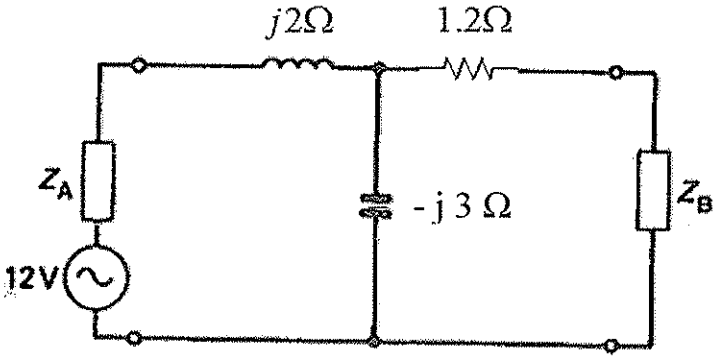


Figure Q4(b)

(i) the image impedances, $Z_A$ and $Z_B$.

(5 marks)

(ii) the output currents through the load.

(4 marks)

(iii) the active power dissipated in the load.

(3 marks)

(iv) the attenuation coefficient and phase change coefficient.

(6 marks)

**Question 5**

(a) A 5km long matched transmission line has primary coefficient R=55 Ω/km, L=28 mH/km, C= 0.07 μF/km and G = 2 μS/km .Given the transmission frequency is 796 Hz. A voltage source of e.m.f. $12\angle 0°$ V with characteristic impedance is connected across the sending end terminal of the line. Calculate

(i) the characteristic impedance

(3 marks)

(ii) the attenuation coefficient and phase change coefficient.

(5 marks)

(iii) the current in the load (in polar form).

(5 marks)

(iv) the power dissipated in the load.

(4 marks)

(v) the distance from sending end of the line which the magnitude of the voltage across the load is 5V.

(3 marks)

(b) A coaxial cable in Figure Q5 (b) is terminated with high frequency signal. Given the relative permeability $\mu_r = 3.2$ and relative permittivity, $\varepsilon_r = 3.2$, calculate the characteristic impedance

(5 marks)

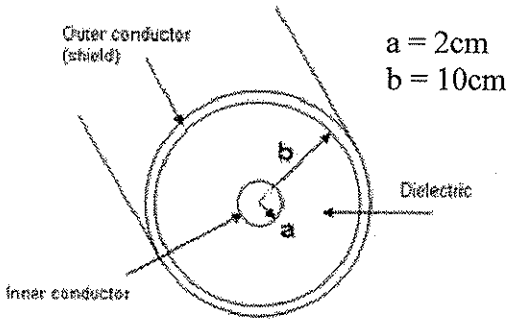


Figure Q5(b)

**Question 6**

(a) Define standing wave and VSWR.

(3 marks)

(b) A transmission has an attenuation of 3dB. A voltage source of e.m.f. 60V with Characteristic impedance of 600Ω is connected across the input terminals of the line. Calculate

(i) the magnitude of the voltage and current across open terminal end.

(5 marks)

(ii) the magnitude of voltage and current across 250Ω load.

(5 marks)

(iii) the magnitude of voltage and current across sending-end. (based on part (ii))

(5 marks)

(c) A 50Ω lossless transmission line is connected to a load composed of a 75Ω resistor in series with a capacitor of unknown capacitance in Figure Q6(c). If at10 MHz the voltage standing wave ratio on the line was measured to be 3, determine the capacitance C.

(7 marks)

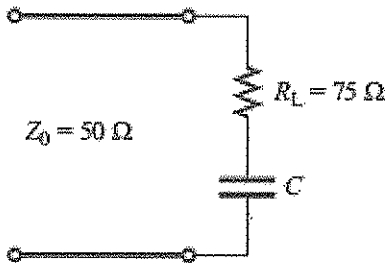


Figure Q6(c)

**--THE END--**