

**FOURTH SEMESTER B.TECH. (ENGINEERING) DEGREE  
EXAMINATION, DECEMBER 2006**

EE 04 403—ELECTRICAL MEASUREMENTS AND MEASURING INSTRUMENTS

(2004 admissions)

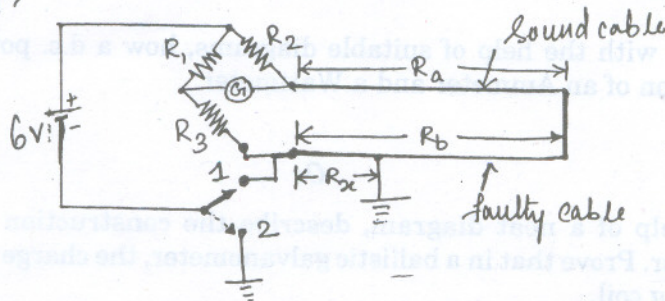
Time : Three Hours

Maximum : 100 Marks

*Assume suitable data required, if any.*

*Answer all the questions.*

- I. (a) Explain the errors which are common to all types of indicating instrument ?
- (b) What are the advantages and disadvantages of permanent magnet moving coil meters ?
- (c) There are two types of connections which can be for a dynamometer type Wattmeter, one where the current coil is on the load side and other where the pressure coil is on the load side. Discuss the errors caused on account of the two connections. Also, explain under what conditions each of the two types of connections should be used.
- (d) In a dynamometer type Wattmeter, the moving coil has 500 turns of mean diameter 30 mm. Estimate the torque if the axes of the field and the moving coils are at (i)  $60^\circ$  ; (ii)  $90^\circ$  when the flux density produced by field coils is  $15 \times 10^{-3} \text{ Wb/m}^2$ , the current in moving coil is 0.05 A and the power factor is 0.866.
- (e) Explain the advantages and disadvantages of Maxwell's Inductance-capacitance bridge.
- (f) A Wheatstone bridge is connected for a Varley loop test as shown in Figure when the switch is in position 1, the bridge is balanced with  $R_1 = 1000 \Omega$ ,  $R_2 = 2000 \Omega$ ,  $R_3 = 100 \Omega$ . When switch is in position 2, the bridge is balanced with  $R_1 = 1000 \Omega$ ,  $R_2 = 2000 \Omega$ ,  $R_3 = 99 \Omega$ . If the resistance of the earthed wire is 0.15 km., how many metres from the bridge has the ground fault occurred ?



- (g) Describe with the help of suitable diagram, how a d.c. potentiometer can be used for calibration of a voltmeter.
- (h) An iron-ring has a mean diameter of 0.1 m. and a cross-section of  $33.5 \text{ mm}^2$ . It is wound with a magnetising winding of 320 turns and a secondary winding of 220 turns, on reversing a current of 10 A in the magnetising winding, a ballistic galvanometer gives a throw of 272 scale divisions, while a Hibbert magnetic standard with 10 turns and flux of  $0.25 \times 10^{-3} \text{ Wb}$  gives a reading of 102 scale divisions, other conditions remaining the same. Find the relative permeability of the specimen.

(8 × 5 = 40 marks)

**Turn over**

- II. (a) Draw an illustrative diagram and explain the construction and working of a hot wire instrument. Why is it not normally used as a standard meter ?

(15 marks)

Or

- (b) (i) A current transformer with a bar primary has 300 turns in its secondary winding. The resistance and reactance of the secondary circuit are  $1.5 \Omega$  and  $1.0 \Omega$  respectively, including the transformer winding, with 5 A flowing in the secondary winding, the magnetising m.m.f. is 100 A and the iron loss is 1.2 watts. Determine ratio and phase angle errors.

(8 marks)

- (ii) What are the advantages and disadvantages of electrostatic meters ?

(7 marks)

- III. (a) With the help of a neat diagram, explain the construction and working of single phase Induction type energy meters. Also derive the expression for deflecting torque in single phase induction type energy meter.

(15 marks)

Or

- (b) Describe in detail the working of a Trivector meter.

(15 marks)

- IV. (a) Explain the working of a meggar with the help of a neat diagram.

(15 marks)

Or

- (b) Explain the direct deflection method for measurements of insulation resistance of cables with the help of a neat diagram.

(15 marks)

- V. (a) (i) Explain the reasons why a separate "standard cell dial circuit" is provided in modern d.c. potentiometers.

(5 marks)

- (ii) Describe with the help of suitable diagrams, how a d.c. potentiometer can be used for calibration of an Ammeter and a Wattmeter.

(10 marks)

Or

- (b) With the help of a neat diagram, describe the construction and working of a ballistic galvanometer. Prove that in a ballistic galvanometer, the charge is proportional to first swing of the moving coil.

(15 marks)

[4 × 15 = 60 marks]