Reg. No. : | | | | | | | | | | | |

D 4178

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2008.

Fourth Semester

Electronics and Instrumentation Engineering

EI 1251 — ELECTRICAL MEASUREMENTS AND INSTRUMENTS

(Common to Instrumentation and Control Engineering)

(Regulation 2004)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — ($10 \times 2 = 20$ marks)

1. State the basic requirement of a measuring Instrument.

2. What is sensitivity of voltmeters?

3. What is a transfer instrument? Why is an electrodynamometer a transfer instrument?

4. Write a short note on adjustments required in energy meters.

5. Draw the circuit diagram of a basic potentiometer.

6. Compare and contrast AC and DC potentiometer.

7. Classify the resistances from the point of view of measurements.

8. What if the importance of the value of Earth's resistance?

9. A Maxwell's capacitance bridge is used to measure an unknown inductance In comparison with capacitance. $R_2 = 200\ \Omega$, $R_3 = 300\ \Omega$, $R_4 = 500\ \Omega$, $C_4 = 0.25\ \mu f$. Calculate the values of R_1 and L_1.

10. What are incremental inductance and permeability?

PART B — (5 × 16 = 80 marks)

11. (a) Describe the construction and working of a ballistic galvanometer. Explain the difference in constructional details of a ballistic galvanometer and D' Arsonval galvanometer. (10 + 6)

Or

(b) Derive the torque equation for moving iron instruments. State the advantages and disadvantages of moving iron instruments. A Moving coil instrument has following data: number of turns 100, Width of coil 20 mm, depth of coil 30 mm, flux density in air gap 0.1 wb/m^2 Calculate the deflecting torque when carrying a current of 10 mA. Spring constant is 2×10^{-6} Nm/degrees. (8 + 3 + 5)

12. (a) (i) Describe the errors in Electrodynamometer type wattmeter. (10)

(ii) Compare moving iron and Electrodynamometer type wattmeter instruments Based on suitability and the application. (6)

Or

(b) (i) Explain the construction and working of LPF (LPF = Low Power Factor) wattmeter. (10)

(ii) In a particular measurement, the wattmeter readings were 2000 and 4000W. Calculate the power and power factor if (1) both meter reads direct (2) one of the meters has to be reversed. (6)

13. (a) Draw neat connection diagram for measuring high voltage and high current with the help of C.T and V.T. What purpose do they serve? (16)

Or

(b) Explain with the help of suitable diagrams, how a.c potentiometer can be used for Calibration of voltmeters, Calibration of ammeter, and Measurement of reactance of a coil? (5 + 5 + 6)

14. (a) (i) Draw the circuit of a Wheatstone bridge and derive the conditions of balance. (12)

(ii) A high resistance of 300 MΩ has a leakage resistance of 600 MΩ between each of its main terminals and the guard terminal. Find the percentage error in measurement if the above resistance is measure by an ordinary Wheatstone bridge without providing guard circuit. (4)

Or

(b) What are the various difficulties encountered in the measurement of high resistance? Explain how these difficulties are overcome. (16)

15. (a) Describe the working of Hay's bridge for measurement of inductance. Derive the equations for balance and draw the phasor diagram under conditions of balance. Why is this bridge suited for measurement of inductance of high Q coils? (16)

Or

(b) What are the different sources of errors in a.c. bridges? Explain the precautions taken and the techniques used for elimination of these errors. (16)
