

Paper ID [A0404]

(Please fill this Paper ID in OMR Sheet)

B.Tech. (Sem. - 3rd)**ELECTRICAL MEASUREMENTS AND MEASURING
INSTRUMENTS (EE - 205)****Time : 03 Hours****Maximum Marks : 60****Instruction to Candidates:**

- 1) Section - A is **Compulsory**.
- 2) Attempt any **Four** questions from Section - B.
- 3) Attempt any **Two** questions from Section - C.

Section - A**Q1)****(10 × 2 = 20)**

- a) Describe the details of standard resistor. What are causes of error in it?
- b) Why is a controlling torque important in an analog indicating instrument?
- c) Describe the errors in electrodynamic wattmeters. Suggest solutions to address them.
- d) Explain the working principle of Vibrating Reed type frequency meter.
- e) Give types of A.C. potentiometers.
- f) Write a method to standardize a potentiometer.
- g) Define the terms as used in instrument transformer : Transformation Ratio, Ratio Correction factor.
- h) Describe the method for the determination of B-H curve of magnetic material using step by step method.
- i) A voltmeter having a sensitivity of $1000 \Omega/V$ reads 100 V on its 200 V scale when connected across an unknown resistor in series with a milli-ammeter. Calculate
 - (i) Apparent resistance of unknown resistor,
 - (ii) Actual resistance of unknown resistor, and
 - (iii) Error due to the loading effect of voltmeter.

- j) A four arm A.C, bridge a, b, c, d has the following impedances:
 Arm ab: $Z_1 = 400 \angle 60^\circ \Omega$ (inductive impedance). Arm ad: $Z_2 = 800 \angle -60^\circ \Omega$ (purely capacitive impedance). Arm bc: $Z_3 = 300 \angle 0^\circ \Omega$ (purely resistive). Arm cd: $Z_4 = 600 \angle 40^\circ \Omega$ (inductive impedance). Determine whether it is possible to balance the bridge under above conditions.

Section - B

(4 × 5 = 20)

- Q2) Explain how Wien's bridge can be used for experimental determination of frequency. Drive the expression for frequency in terms of bridge parameters.
- Q3) Discuss the sources of error in Moving Iron Instruments used for a.c. and d.c. measurements. Also, list the advantages and disadvantages of them.
- Q4) A manufacturer lists grain oriented steel sheet 0.3 mm thick. The resistivity of material is $80 \times 10^{-8} \Omega \text{m}$. The hysteresis loop is essentially rectangular in the form, with a coercive force of 12 A/m for all peak values of flux densities between 0.8 to 1.6 Wb/m² (peak) at 100 Hz is used. The density of material is 7650 kg/m³. Find the total loss/kg.
- Q5) Describe the design and constructional features used in current transformers to reduce error.
- Q6) What are systematic errors? Explain its types in brief.

Section - C

(2 × 10 = 20)

- Q7) Calculate the inductance of a coil from the following measurement on an a.c. potentiometer. Voltage drop across a 0.2Ω standard resistor connected in series with the coil = $0.813 \angle 12^\circ 6'$ voltage across the test coil through a 1000/1 volt-ratio box = $0.781 \angle 50^\circ 48'$ V. Frequency is 60 Hz.
- Q8) Derive the equations of balance for an Anderson's bridge. Draw the phasor diagram for the conditions under balance. Discuss the advantages and disadvantages of the bridge.
- Q9) Write short note on :
- Thermoelectric Instruments.
 - Maxwell bridge method for iron loss and permeability measurement.

