

**ELECTRICAL ENGINEERING DEPARTMENT, MNNIT ALLAHABAD**  
**B. Tech. III-Sem. (Electrical Engineering): End Semester Examination-2016**  
**Subject: Electrical Measurement & Measuring Instruments (EE 1302)**

**Time: 3:00 Hr.**

**Max. Mks.: 60**

**Note: Attempt any FIVE questions. All questions carry equal marks.**

- 1(a). Enumerate the dynamic characteristics of a measuring system. Explain the terms (i) speed - response, (ii) measuring lag, and (iii) Fidelity.
- (b) In order to measure the direct current in a wire 5 A range ammeter is connected in series with it and indicates 4 A. When the 5 A ammeter is replaced by 10 A range ammeter, the reading is 4.2 A. Both meters are known to be accurate and each produces full-scale deflection for a 50 mV instrument drop. What is the value of current in the wire when neither meter is in circuit? (5+5)
- 2(a). With the help of diagram, explain the principle of operation of induction type instruments.
- (b) Mention different types of errors in energy meters. Discuss the friction compensation and creep prevention in an energy meter. (5+5)
- 3(a) What are the special problems associated with measurement of low resistance? How this problem is taken care in Kelvin's double bridge.
- (b). Draw the circuit diagram of Q-meter for measuring high impedance components (parallel connection) and derive the expression for quality factor and its parameters. Explain different types of errors in Q-meters and its correction. (5+5)
- 4(a) Explain the working principle of Schering bridge and derive an expression for measurement of unknown capacitance. Draw the phasor diagram under null condition and explain how dissipation factor of the capacitor can be calculated.
- (b) The four arms of Maxwell's capacitance bridge at balance are: arm AB, an unknown inductance  $L_1$ , having an inherent resistance  $R_1$ ; arm BC, a non-inductive resistance of  $1000\Omega$ ; arm CD, a capacitor of  $0.5\mu F$  in parallel with a resistance of  $1000\Omega$ ; arm DA, a resistance of  $1000\Omega$ . Derive the equation for balance of bridge and determine the value of  $R_1$  and  $L_1$ . (5+5)

(P.T.O.)

5(a) With the help of diagram explain the operation of Cathode Ray Oscilloscope. Describe the method of measurement of amplitude, frequency and phase difference using oscilloscope.

(b) Give the different method frequency measurement. Explain the working principle and operation of electrical resonance method (ferro-dynamic type) of frequency measurement. (5+5)

6(a) Describe the principle of operation and working of dynamometer type of power factor meters. Explain its merit and demerits over the moving iron type.

(b) What is instrument transformer? Discuss the advantages of using instrument transformer in measurement of current, voltage and power. (6+6)

7. (a) Draw the block diagram of a digital to analog converter and describe each component in brief. Draw the diagram of R-2R ladder and binary weighted resistor network of DAC and describe its operation. Compare their features.

(b) Draw the diagram of "successive approximation type" of analog to digital converter and describe its working. Compare its features with "dual-slope type". (6+6)