

EE 443: Electrical Measurements and Measuring Instruments (EE/IE)

L T P

(3 - 1 - 2)

Theory Marks = 100

Sessional Marks = 50

Laboratory Marks = 50

1. Characteristic of instruments and measuring systems:

Static characteristic – accuracy, sensitivity, reproducibility, drift, static error and dead zone. Dynamic characteristic- response to step and sinusoidal signals. Errors occurring in measurement.

2. Measuring Instruments:

Electro-dynamic, rectifier and induction type ammeters and voltmeters – construction, operation, errors and compensation, Electro-dynamic and induction type watt meters, Single phase induction type energy meter. MC and MI type power factor meters. Electro-dynamometer type frequency meter, Synchroscope.

3. Measurement of resistance:

Wheaston bridge method – sensitivity of the Wheaston Bridge – precautions to be taken while making precision measurements, Limitations, Carey-Foster slid Wire Bridge.

Measurement of low resistance – Kelvin’s Double Bridge.

Measurement of high resistance – direct deflection method. Measurement of volume and surface receptivity. Loss of charge method. Measurement of insulation resistance with power on.

4. Potentiometers:

D. C. potentiometer – basic principle. Laboratory type potentiometer. Methods of standardization. Applications- calibration of ammeters and voltmeters, measurement of resistance and power - calibration of watt meters. Volt ratio box, A. C. potentiometers – difference between A. C. and D. C. potentiometers. Types - polar and co-ordinate type. Application of A. C. potentiometer.

5. A. C. Bridge:

General principle, Balance equation. Sources and Detectors used in A. C. Bridges. Balance condition and Phasor diagrams of Maxwell’s bridge, Anderson’s bridge, Owen’s bridge, De Sauty’s bridge, Low voltage Schering Bridge, Heavy-side mutual inductance Bridge.

6. Magnetic Measurement:

Magnetic hysteresis, alternating current magnetic testing, separation of iron losses. Measurement of iron losses by the watt meter method, Cambell’s bridge method and the Oscillographic method.

7. Instrument Transformer:

Use of instrument transformers – ratio, burden. Theory and operation of CTs and PTs – errors and compensation – CT testing – mutual inductance method, Silbee’s method. PT testing – comparison method. Power and energy measurement using CTs and PTs. Effect of reverse polarity connection of one of the CTs on 3-phase energy meter.

8. C.R.O.:

Basic construction, main parts, principle of operation, Applications. (Thurst has to be to use C.R.O. through suitably designed laboratory experiments)

9. Galvenometers:

Ballastic, D’Arsonal, and Vibration galvanometers

Books:

1. Golding and Widdis – Electrical Measurements and measuring instruments.
2. A.K. Sawhney – Electrical and Electronic Measurements and Instrumentation