

ELECTRICAL MEASURING INSTRUMENTS (for ETC)
(EE-304)

Time: 3 hours

Full Marks: 70

Use separate answer script for each half.

Answer SIX questions, taking THREE from each half.

Two marks are reserved for neatness in each half.

FIRST HALF

- 1.(a) (i) Describe the construction and operating principle of a dynamometer instrument. (ii) Why the current coil of this instrument is split up into two identical halves?
(b) A dynamometer wattmeter is used to measure power in a load circuit of resistance 100Ω and inductance 350mH . The supply voltage is 220V , 50Hz , a.c. The voltage coil has resistance 1000Ω and inductance 8.5mH . Calculate the percentage error of the wattmeter. Neglect the impedance of current coil. The moving coil is connected to the load end. [(6+1)+4]
- 2.(a) What is the basic principle of operation of thermal instruments?
(b) Describe the working principle of thermo-couple instrument.
(c) Enumerate the advantages and disadvantages of thermo-couple instrument. [1+6+4]
- 3.(a) Derive an expression for deflecting torque of quadrant electrometer.
(b) How can this instrument be used for both a.c. and d.c. applications. [7+4]
- 4.(a) With necessary circuit and phasor diagrams, find an expression for torque equation of induction wattmeter.
(b) What modifications in construction are needed to measure a.c. energy by this instrument? [7+4]
5. Write notes on the following: [7+4]
 - (a) Repulsion type moving iron ammeter
 - (b) Errors and their compensations in Ampere-hour meter

SECOND HALF

6. (a) What are the advantages of Induction method of cable testing?
(b) Describe the Induction method of cable testing with suitable illustration.
(c) A feeder cable 300 meters long has a earth fault. The fault is localised by the following resistance measurements between earth and one of the cable. (i) Distant end insulated, 6Ω
(ii) Distant end earthed, 1.7Ω . The cable has a total resistance of 1.8Ω . Find the resistance of the fault and its distance from the testing end. (2+4+5)
7. (a) Draw the trace of Lissajous pattern when frequency ratio F_y/F_x is 1:3
(b) How CRO can be used to measure the frequency of an unknown signal? Explain.
(c) Find out the phase angle difference of two sinusoidal signal of equal magnitude from the Lissajous pattern as shown in figure 1. Deduct the necessary expression prior to use. (2+4+5)

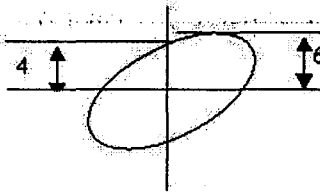


Figure 1: Lissajous Pattern

8. (a) What are the advantages of Current and Potential Transformers?
(b) Write a brief note on Potential Transformer and Current Transformer.
(c) Define the different ratio of a CT and then derive the expression of ratio error. (2+4+5)
9. (a) Explain "Volume" and "Surface" resistance of an insulation material.
(b) How ammeter shunt and capacitor multiplier are used? Explain with suitable illustrations.
(c) Derive the expression of errors in Wheatstone Bridge method. (2+4+5)
10. Write short notes on any of the two following topics: (5½ × 2)
- (a) Class of Meter and Standardization
(b) Different methods of correction of CT ratio error.
(c) Kelvin Double Bridge method