

ELECTRICAL MEASUREMENTS
(Electrical and Electronics Engineering)

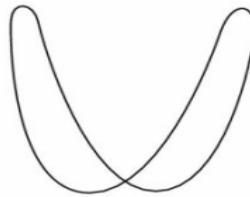
Time: 3 hours

Max. Marks: 70

PART – A
(Compulsory Question)

1 Answer the following: (10 X 02 = 20 Marks)

- (a) What is 'Swamping Resistance'? What is/are its characteristic(s)?
(b) What is the ratio of vertical to horizontal frequencies for an oscilloscope which displays the following Lissajous figure?



- (c) Frequency can be measured with which type of AC Bridge.
(d) How is the effect of Thermo-Electric EMFs eliminated when taking the readings with Kelvin's double bridge?
(e) What is Phantom loading? Why is it used?
(f) Write short notes on the shape of scale of an Electrodynamometer type wattmeter.
(g) Why should the secondary winding of a current transformer be never opened while its primary winding is energized?
(h) Under what conditions, the phase angle error in potential transformers taken negative and under what conditions it is taken as positive ?.
(i) What are Ballistic tests?
(j) List the three types of methods used for measurement of iron losses in ferromagnetic materials.

PART – B

(Answer all five units, 5 X 10 = 50 Marks)

UNIT – I

- 2 (a) What type of instrument is used for 'AC measurements' and what type of instruments is used for DC measurements and what type of instrument is used as 'transfer instrument'?
(b) The inductance of a moving iron ammeter with a full scale deflection of 90° at 1.5 A is given by the expression $L = 200 + 40\theta - 4\theta^2 - \theta^3$ μH , where θ is the deflection in radian from the zero position. Estimate the angular deflection of the pointer for a current of 1.0 A

OR

- 3 Draw and explain the general block diagram of a Cathode Ray oscilloscope? How is frequency measured in a cathode ray oscilloscope?

Contd. in page 2

UNIT – II

- 4 (a) What type of bridge can be used for the measurement of dielectric of insulating oil used in transformers? Justify.
(b) With a neat phasor diagram, explain how capacitance of an unknown capacitor can be determined using Schering bridge.

OR

- 5 Identify and draw the phasor diagram of the bridge whose arms of a five node bridge are as follows:

arm ab: an unknown impedance (R_1, L_1) in series with a non-inductive variable resistor r_1 ,

arm bc: a non-inductive resistor $R_3 = 100 \Omega$;

arm cd: a non-inductive resistor $R_4 = 200 \Omega$;

arm da: a non-inductive resistor $R_2 = 250 \Omega$;

arm de: a non-inductive variable resistor r ,

arm ec: a loss-less capacitor $C = 1 \mu\text{F}$, and **arm be:** a detector.

An AC supply is connected between **a** and **c**.

Also calculate the resistance and inductance R_1 , and L_1 . When under balance conditions $r_1 = 43.1 \Omega$ and $r = 229.7 \Omega$?

UNIT – III

- 6 (a) Why is the measurement of power in circuits with low power factor by ordinary electro-dynamometer wattmeters is difficult and inaccurate? What special features are to be incorporated in the above type of wattmeters to make it a 'low power factor type wattmeter'?
(b) A 3-phase 500 V motor load has a power factor of 0.4. Two wattmeters are connected to measure the input. They show the input to be 30 kW. Find the reading of each meter.

OR

- 7 With a neat sketch of phasor diagram, explain the construction and working principle of a single phase Induction type energy meter.

UNIT – IV

- 8 What is the transformation ratio of a Current transformer? What are the causes of errors in current transformers? Explain the design considerations that are to be taken to minimize those errors.

OR

- 9 (a) How is DC potentiometer used in the calibration of voltmeter and ammeter?
(b) How can AC potentiometer be used for the measurement of self reactance of a coil?

UNIT – V

- 10 Explain the use of Ballistic Galvanometer for the measurement of magnetic flux.

OR

- 11 How is Hysteresis loop determined by method of reversals?
