Time: 3:00 Hr.   Max. Mks.: 60

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

1. (a) Name the static performance parameters of the instruments. Differentiate between (i) Accuracy and Precision and (ii) Resolution and Threshold.

(b) A voltmeter with internal resistance of 200 kΩ is connected across an unknown resistance. It reads 250 V and the ammeter (with negligible resistance) connected in series with the resistance reads 10 mA. Determine the (i) apparent resistance (ii) actual resistance and the loading error.

If the same voltmeter and ammeter connected in another unknown resistance read 100 V and 2 A, determine the loading error.

2. (a) Describe the constructional details and derive the expression of torque equation for a moving iron instrument. List the errors and the method of compensation. What is essential difference between a moving iron and moving coil instruments?

(b) An electro-dynamic wattmeter reading correctly on dc is used to measure power in circuit of resistance 2Ω and inductance of 0.25 H. The supply is 200 volts at 50 Hz and the pressure coil circuit of wattmeter has a resistance of 1000 Ω and inductance of 5.6 mH. What is the actual reading on the wattmeter? Neglect the impedance of current coil circuit. Assume that the pressure coil is connected on the load side of the instrument.

3. (a) Describe some typical operating and performance characteristics of digital voltmeter. Draw the block diagram of true RMS-responding voltmeter and explain its working. Discuss its important features.

(b) Draw the circuit diagram and explain the working of dynamometer type power factor meter.

(c) Name the different types of special oscilloscopes. Discuss the working of digital storage oscilloscope.

4. (a) Describe with the help of a neat sketch the essential features of construction of any one type of ac potentiometer. Explain how the above potentiometer is standardised. Describe some of the applications of these potentiometers.

(P. T. O.)

(b) A dielectric sheet of thickness 1 mm is tested at 50 Hz between two electrodes of $\times$ diameter. The Schering Bridge employed has a standard compressed air capacitor C_3 of 100 a non-inductive resistor R_4 of 350 Ω in parallel with a variable capacitor C_4 and a non-inductive variable resistance R_2. At balance $C_4=0.4$ μF, $R_2= 250$ Ω. Calculate the power factor and the permittivity of the sheet. .

5. (a) What are the special problems associated with measurement of high resistance of the order of mega ohms? Describe the method of measuring high resistance using "Mega Ohm Bridge".

(b) Draw the circuit diagram of Q-meter for measuring low impedance components (series connection) and derive the expression for quality factor and its parameters (R_s, L_s & C_s).
A coil is tuned to resonance at 500 kHz with a resonating capacitance of 36 pF. At 250 kHz the resonance is obtained with a resonating capacitance of 160 pF. Determine the self (distributed) capacitance and inductance of the coil.

6(a) Explain the principle of operation of current transformer with the help of phasor diagram. Derive the expression of ratio error and phase angle error.
Mention some precautions to be taken while using a CT.

(b) Compare the features of a CT and PT.

A 1000/5, 50 Hz, 12.5 VA is of bar primary type. The secondary winding has 196 turns and its leakage inductance is 0.96 mH. At the rated burden (resistive load) of the transformer, find the ratio and phase angle errors. The magnetising and loss component currents are 16 A and 12 A respectively.

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 of DAC and describe its operation.

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