

**BACHELOR OF ENGINEERING (ELECTRICAL ENGINEERING) SECOND YEAR
FIRST SEMESTER SUPPLEMENTARY EXAM 2024**

SUBJECT: - ELECTRICAL MEASUREMENT & MEASURING INSTRUMENTS

Time: Three hours

**Full Marks 100
(50 marks for each part)**

Use a separate Answer-Script for each part

| PART-II | | Marks |
|---------|--|-------|
| | Answer any FIVE questions. | 10×5 |
| 1. | Prove that in Wheatstone Bridge based resistance measurement, the bridge sensitivity becomes maximum when the bridge arms carry equal resistances. Explain the purpose of 2 nd ratio arm in Kelvin Double Bridge for measurement of low resistance. | 5+5 |
| 2. | A series type ohmmeter has a moving system with 60 Ω internal resistance (R_m). If the full-scale deflection current is 1.2 mA, internal supply battery voltage is 3 V and the desired scale marking for half-scale deflection is 1500 Ω, determine (i) Series resistance (R_{se}) and shunt resistance (R_{sh}) (ii) maximum value of R_{sh} to compensate for 10% drop in battery voltage (iii) error at the half scale mark when R_{sh} is set at a value obtained in (ii). | 10 |
| 3. | Describe with the help of neat diagram, Price's Guard wire method for measurement of insulation resistance. | 10 |
| 4. | Explain the term 'Standardization' of a dc potentiometer. How can you make a dual range dc potentiometer (namely X1, X0.1) by connecting two resistances parallel to the total dial resistance? Derive necessary relations. | 10 |
| 5. | Describe the Llyod-Fisher square for measurement of iron losses in a specimen of laminations. How the corrections for resistance of wattmeter pressure coil and resistance of secondary winding are applied? | 5+5 |
| 6. | The four arms of an AC bridge at balance are: arm AB an unknown inductance L_1 having an inherent resistance R_1 ; arm BC a non-inductive resistance of 100Ω; arm CD a capacitance of 0.5μF in parallel with a resistance 100Ω; arm DA a resistance of 1000Ω. The source is connected to A and C and the detector is connected between B and D. Derive the equations for balance and find the values of R_1 and L_1 . | 10 |
| 7. | How does the ambient temperature variation affect the measurement accuracy in strain gauges? Under what condition is a dummy gauge used? Derive bridge sensitivity in such a condition for Wheatstone bridge method based strain measuring system using one active and one dummy gauges. | 3+2+5 |