

## B.E.E. (EVENING) 2<sup>ND</sup> YR 1<sup>ST</sup> SEMESTER SUPPLE EXAMINATION, 2018

**SUBJECT: - ELECTRICAL MEASUREMENT AND MEASURING INSTRUMENTS**

Full Marks 100

Time: Three hours

(50 marks for each part)

Use a separate Answer-Script for each part

### PART - I

Answer any **FIVE** questions.

10×5

1. Prove that in DC Wheatstone Bridge, the bridge sensitivity becomes maximum when the multiplier ratio becomes unity. Explain the purpose of 2<sup>nd</sup> ratio arm in Kelvin Double Bridge for measurement of low resistance. 10
  
2. 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 gauge. 3+2+5
  
3. Describe with the help of neat diagram, the loss of charge method to determine the insulation resistance of a short length of cable and derive an expression for determination of insulation resistance. 10
  
4. Explain the term 'Standardisation' of a potentiometer. Prove that in a multi-range dc potentiometer circuit current through the slide wire for X0.1 position is 1/10<sup>th</sup> of the current through the slide wire for X1 position, source current being the same for both cases. 10
  
5. What are ballistic tests used for testing of magnetic materials? How is flux density determined in the ring type specimen of magnetic material? How is correction made for the flux in the space between specimen and the search coil wound round it? 3+3+4
  
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  $100\Omega$ ; arm CD a capacitance of  $0.5\mu\text{F}$  in parallel with a resistance  $100\Omega$ ; arm DA a resistance of  $1000\Omega$ . 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. What are the merits and demerits of thermistor? What is meant by the specification "Pt-100 RTD"? 5+5  
What is the importance of Cold Junction Compensation for a temperature measuring circuit using thermocouple?

[ Turn over

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Full Marks 100

Time: Two hours/Three hours/ Four hours/ Six hours

(50 marks for each part)

Use a separate Answer-Script for each part

PART II		Marks
	<b>Answer Question:1 and any TWO from the rest:</b>	
1	<b>Answer any four :</b> a) General shunt and universal shunt. b) Damping torque and braking torque c) Pressure coil and current coil of electrodynamicometer type wattmeter d) Meter scale of PMMC type and rectifier-PMMC type instruments. e) Electromagnetic and eddy current damping? f) Shunt and multiplier of moving iron type instruments.	4X5=20
2	a) Prove that electromagnetic damping in an indicating instrument is inversely proportional to coil resistance. b) Explain the working principle of repulsion type moving iron instrument showing its constructional parts. c) Proof that L/R ratio of fixed coil to shunt in moving iron type ammeter is equal.	5+5+5
3	a) Draw the phasor diagram for pressure coil and current coils phasors in electrodynamicometer type wattmeter and hence derive the expression of deflection . Determine the expression of % error in reading considering true watt and observed watt. Why this error occurs?	

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4	<p>b) What is purpose of compensating coil in wattmeter?</p> <p>c) A wattmeter with resistance of the two coils as 0.01 ohm and 1000 ohm , respectively is used to measure the power supplied to a resistive load . The load current and voltage may be taken as 20A and 30V respectively. Calculate the % error in the readings for two different connections between voltage and current coils of wattmeter.</p> <p>a) Show that the actual ratio of current transformer at resistive secondary burden is given by : <math>K = n + \frac{I_e}{I_s}</math>  , where n , I<sub>e</sub> and I<sub>s</sub> are the turns ratio, loss component of magnetizing current and secondary current respectively.</p> <p>b) Explain the purpose of using brake magnet in induction disc type energy meter</p> <p>c) What is creep and why it occurs in induction disc type energy meter</p>	5+5+5
5	<p><b>Write short notes on any three:</b></p> <p>i) Critical Damping External Resistance(CDRX)</p> <p>ii) Tuning of vibration galvanometer</p> <p>iii) Logarithmic Decrement.</p> <p>iv) Turns compensation in C.T.</p> <p>v) Ballistic galvanometer.</p>	6+5+4
		5+5+5