Ref No: Ex/EE/5/T/211/2023(S)

BACHELOR OF ENGINEERING (ELECTRICAL ENGINEERING)

2ND YEAR 1ST SEMESTER SUPPLEMENTARY EXAMINATION, 2023

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-I

Answer any five Questions. **Marks 5×10=50**

1. What modifications are made in the basic Wheatstone bridge circuit to convert it into Kelvin's double bridge for low resistance measurement? Explain the method of such measurement of a low resistance using Kelvin's double bridge with the help of a circuit diagram. 5+5

2. What are the problems associated with the measurement of high resistances of the order of Megohms? Describe Price's guard wire method of measuring high resistance with the help of a diagram. 4+6

3. Why is a low resistance made with four terminals? With necessary circuit diagram explain the method of calibration of wattmeter using dc potentiometer. 3+7

4. A shunt type ohmmeter has a d'Arsonval movement of resistance 2 Ω. Its full-scale deflection current is 10 mA and the battery voltage is 3 volts. Determine the value of current limiting resistor so that the meter indicates 0.5 Ω at the midpoint of its scale. Briefly explain the operation of such an ohmmeter. 5+5

5. 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. 2+2+6

6. Describe the Lloyd-Fisher square method for measurement and separation of iron losses in a specimen of magnetic material. 6+4
In magnetic loss test of a specimen of total weight 10 kg the measured values of iron loss at a given peak flux density were 36 watts at 40 Hz and 78 watts at 60 Hz. Estimate hysteresis and eddy current losses in Watt/kg at 50 Hz for the same peak flux.

7. The arms of an AC bridge are as follows: AB is an inductive resistor; BC and ED are variable resistors. Branches CD and DA are non-inductive resistors of 400 ohms each and branch CE is a capacitor of 2 μF. The supply is connected across 'A' and 'C' and the detector across 'B' and 'E'. Balance is obtained when the resistors in arm BC and in the arm ED are 400 ohms each. Determine the resistance and inductance of arm AB. Derive the necessary bridge balance formula. 5+5

[Turn over

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BACHELOR OF ELECTRICAL ENGINEERING(EVE) 2ND YR 1ST SEMESTER

SUPPLIMENTARY EXAMINATION, 2023

(1st / ~~2nd~~-Semester/~~Repeat~~/Supplementary/~~Annual/Bi-Annual~~)

SUBJECT: - ELECTRICAL MEASUREMENT & MEASURING INSTRUMENTS.

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

Full Marks 100
(50 marks for each part)

Use a separate Answer-Script for each part

No. of Questions	PART II	Marks
	Answer Question:1 and any TWO from the rest:	
1.	***Answer any 4 of the following:***	
	a) What is the significance of CDRX for tunning D' Arsonval galvanometer to critically damped?	
	b) Why the performance of rectifier type PMMC meter will depend upon the form factor of input signal?	
	c) Why L/R ratio of the shunt and fixed coil of moving iron type instrument should be equal?	
	d) Why the scale of electrodynamometer type ammeter and voltmeter is non uniform but it is uniform in dynamometer type wattmeter?	
	e) Explain why the speed of disc rotation in induction disc type energy meter will not be uniform without braking torque.	
	f) Why the secondary circuit of CT should be opened, when its primary is energized?	4X5=20
2.	a) Prove that electromagnetic damping in an indicating instrument is inversely proportional to coil resistance.	
	b) Distinguish between the working principle of moving iron attraction type and repulsion type instruments with the help of diagram.	
	c) A PMMC instrument has the coil resistance of 50 ohm and gives full scale deflection, when carrying current of 50 mA. Find the shunt resistance to convert the meter to 10 A multirange DC	

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BACHELOR OF ELECTRICAL ENGINEERING(EVE) 2ND YR 1ST SEMESTER

SUPPLIMENTARY EXAMINATION, 2023

(1st / ~~2nd~~-Semester/~~Repeat~~/Supplementary/~~Annual/Bi-Annual~~)

SUBJECT: - ELECTRICAL MEASUREMENT & MEASURING INSTRUMENTS.

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

Full Marks 100
(50 marks for each part)

	ammeter. Find the multiplier resistance to convert to 300 V multirange voltmeter.	5+5+5
3.	a) Explain with the phasor diagram, why the observed reading by dynamometer type wattmeter differs to true watt reading. b) The inductive reactance of the voltage coil of dynamometer type wattmeter is 0.4% of its resistance at normal frequency. Calculate the % error and correction factor in reading for load p.f. of 0.707 lagging c) Explain the purpose of compensating coil used in dynamometer type wattmeter.	5+5+5
4.	a) Derive the expression of driving torque working on disc of induction type energy meter with the help of phasor diagram. b) Derive the expression for ratio and phase angle error of a current transformer, with the help phasor diagram.	9+6
5.	Write short notes on any three of the following: a) Logarithmic decrement and its application b) Lag adjustment in induction disc energy meter c) General shunt and universal shunt. d) Tuning of vibration galvanometer. e) Turns compensation of C.T.	5+5+5