Total number of printed pages:

Programme(D)/ 5th Semester/DIE503

2024

ELECTRICAL AND ELECTRONIC MEASUREMENTS

Full Marks : 100

Time : Three hours

The figures in the margin indicate full marks for the questions. e margin man. Answer any five questions.

1.	a)	What are the different operating forces that act in an electromechanical instrument? Explain these forces.	2+6=8
	b)	How do you increase the current and voltage range of a galvanometer beyond the capacity of the coil? Give the necessary circuit diagram and explanation.	4+4=8
	c)	What are the advantages of an electrostatic instrument?	1+3=4
		If a voltage of 300 V is applied on an electrostatic type instrument, which causes a change in the capacitance of 2μ F for a corresponding change in the displacement of 1.5 mm, determine the force that will be developed.	
2.	a)	What are the different types of supports used in PMMC type instruments? Explain about pivot and jewel bearing type support.	2+3=5
	b)	Describe the working principle of electrostatic type instrument. Why damping is required in Galvanometers? Explain about a damping technique.	5+1+2=8
	c)	What are the advantages of a moving iron type instrument? With the help of circuit diagram explain how an electrodynamometer type instrument works?	2+5=7
3	a)	Discuss why ammeter-voltmeter leads to errors in the measurement of resistance?	3+6=9
		In case of a Kelvin's double bridge, standard resistor 100.03 $\mu\Omega$; Inner ratio arms = 100.31 Ω and 200 Ω ; outer ratio arms = 100.24 Ω and 200 Ω ; resistance of link connecting the standard and the unknown resistance 700 $\mu\Omega$. Calculate the unknown resistance to the nearest 0.1 Ω .	
	b)	What is the role of guard connection in the measurement of high resistance? How do you measure the high resistance using loss of charge method?	1+5+5=11

Explain the working of megohm bridge.

4 a) Determine the phase angle for a load of $15 + j10 \Omega$. Draw the phasor diagram 4+5+2=11 of voltage and current for the load impedance.

Derive the expression of unknown inductance in case of Maxwell's inductance bridge. Also draw the phasor diagram of the currents and voltages.

b) What do you mean by storage and dissipation factors? Obtain the equation 2+5+2=9 of unknown capacitance for Schering bridge and draw the phasor diagram.

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5 a) In the following bridge the arm ab has unknown resistor and inductor; arm bc is $R3 = 100 \Omega$; arm cd is $C4 = 0.1 \mu$ F and arm da is $R_2 = 834 \Omega$ in series with $C = 0.124 \mu$ F. Derive balance conditions and calculate R_1 , L_1 and the effective impedance of arm ab if frequency= 2kHz.



b) What will be the overall inductances for the following diagrams (a) and (b)? 2+7=9



Show how Heaviside mutual inductance bridge gives the value of unknown mutual inductance?

c) What is the relationship between frequency (ordinary) and angular 1+3=4 frequency? and Draw the circuit diagram of Wien's bridge and write its balance equation

6	a)	What are the advantages of digital instruments over the analog counterparts? Explain the working of ramp type digital voltmeter with the help of diagram.	2+6=8
	b)	Describe how a cathode ray oscilloscope works? Briefly discuss the steps for the working of a digital storage oscilloscope.	8+4=12
7		Write short notes on any four of the following:	4×5=20
		i) d'Arsonval type galvanometer	

- ii) a Arsonval type galvanometeriii) Single phase induction type energy meter
- iii) Megger
- iv) Electronic voltmeter
- v) Direct deflection method of high resistance measurement

