Course Code: 1950210 Roll No: **MLRS- R19**

MARRI LAXMAN REDDY
INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(AN AUTONOMOUS INSTITUTION)
(Approved by AICTE, New Delhi & Affiliated to JNTUH, Hyderabad)
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III B.Tech I Sem Supply End Examination, December 2022

Measurements and Instrumentation

(EEE)

Time: 3 Hours. **Max. Marks: 70**

Note: 1. Question paper consists: Part-A and Part-B.
2. In Part – A, answer all questions which carries 20 marks.
3. In Part – B, answer any one question from each unit.
Each question carries 10 marks and may have a, b as sub questions.

PART- A

(10*2 Marks = 20 Marks)

1.	a)	How the PMMC Ammeter range is extended?	2M	CO1	U
	b)	What are the different types of errors present in electrical measuring instruments?	2M	CO1	R
	c)	List any two AC potentiometers.	2M	CO2	R
	d)	Why the secondary of a Current Transformer is never left open-circuited?	2M	CO2	U
	e)	What are the errors present in the energy meter?	2M	CO3	R
	f)	Explain the methods used for low resistance measurement.	2M	CO3	U
	g)	Why Hay's bridge suited for the measurement of inductance of high Q coils?	2M	CO4	R
	h)	Describe, why Anderson's bridge is suited for measurement of the inductance of low Q coils?	2M	CO4	U
	i)	Explain the working principle of Digital Multi-meter.	2M	CO5	U
	j)	What is the relation between scale factor and sensitivity of a transducer?	2M	CO5	R

PART- B

(10*5 Marks = 50 Marks)

2	a)	Describe the constructional details and working of a moving iron attraction type meter. Derive the torque equation.	5M	CO1	U
	b)	A 0-100 mA moving iron ammeter is converted to a 0-500 V, 50Hz voltmeter by adding a series resistance with the coil. The coil has negligible resistance and inductance of $(0.01+0.2\theta)/4\Pi$ henry, the total angular span of the meter is 1000. Calculate the spring constant and series resistance required.	5M	CO1	Ap
		OR			
3	a)	Describe the construction and working of PMMC instrument with neat diagram.	5M	CO1	U
	b)	A set-up is made to measure the resistance (R). The ammeter is connected in series with R and a voltmeter is connected across R. The ammeter and voltmeter resistances are 0.01 ohm and 2000 ohm respectively. Their readings are 2A and 180V respectively, giving a measured resistance of 90 ohm. Find the percentage error in the instrument.	5M	CO1	Ap

4	a)	Derive the expression to find out ratio error and phase angle error of a current transformer by using Silsbee's test.	5M	CO2	U
	b)	A basic slide wire potentiometer has a working battery voltage of 3V. The resistance of slide wire is 400 ohm and its length is 200 cm. The slide wire has 1mm scale divisions and it is possible to read up to 1/5 of a division. The instrument is standardized with 1.018 V standard cell with sliding contact at 101.8 cm. Calculate (i) working current (ii) the resistance of series rheostat (iii) the measurement range (iv) the resolution of instrument	5M	CO2	Ap
		OR			
5	a)	Explain the working principle of current transformer with neat sketch.	5M	CO2	U
	b)	The no-load current of CT is magnetizing component is 110A, core loss component is 45A. The CT has a transformation ratio is 2000/10A. Calculate the ratio error at full load.	5M	CO2	Ap
6	a)	How can you measure Energy consumption with single phase Analog energy meter? Explain in detail with neat diagram and phasor analysis?	5M	CO3	U
	b)	Find the power factor and power using two wattmeter method in leading power factor. Derive the equations using necessary phasor and circuit (star) diagrams. Consider RBY phase sequence.	5M	CO3	Ap
		OR			
7	a)	With a neat sketch, the phasor diagram, derive the equations for 3-phase power consumed by balance load and its power factor using two wattmeter method.	5M	CO3	U
	b)	A watt meter reads 400W when its current coil is connected in the Rphase and its pressure coil is connected between R phase and the neutral of a symmetrical 3 phase system supplying a balanced star connected 0.8 P.f inductive loads. Phase sequence is RYB. What will be the reading of this wattmeter if its pressure coil alone is reconnected between the B and Y phases, all other connections remaining as before?	5M	CO3	Ap
8	a)	With neat sketch and phasor diagram develop the equations for measuring unknown capacitance and dissipation factor by using Schering bridge.	5M	CO4	U
	b)	Explain the methods for the measurement of high AC voltage.	5M	CO4	U
		OR			
9	a)	What is Maxwell's bridge? Derive the equation of balance for the bridge.	5M	CO4	U
	b)	Show how Wien's bridge can be used for the measurement of frequency in the audio range. Derive the equation for frequency f.	5M	CO4	U
10	a)	With a neat sketch explain the working principle of the resistance strain gauge. Derive the equation for the gauge factor of the resistance strain gauge.	5M	CO5	R
	b)	How can we measure displacement with a transducer? Explain in detail.	5M	CO5	U
		OR			
11	a)	Explain the principle of operation of Piezo electric transducers in detail with a neat sketch.	5M	CO5	R
	b)	Explain the basic principle of the thermocouples with a neat sketch and also explain the operation of thermocouples used for measuring temperature.	5M	CO5	U