ADDITIONAL CONTROLLER OF EXAMINATIONS
AU
CHENNAI
600 025

Roll No. | | | | | | | | | | |

ANNA UNIVERSITY (UNIVERSITY DEPARTMENTS)

B.E. /B.Tech (Full Time) - END SEMESTER EXAMINATIONS, APRIL / MAY 2024

Department of Electrical and Electronics Engineering
Semester IV
EE 5404 – Measurements and Instrumentation
(Regulation 2019)

Time:3 Hours | Answer ALL Questions | Max. Marks100

CO1	Able to understand the fundamental art of measurement in engineering.
CO2	Able to understand the structural elements of various instruments.
CO3	Able to understand the importance of bridge circuits.
CO4	Able to understand about various transducers and their characteristics by experiments.
CO5	Able to understand the concept of digital instrumentation and virtual instrumentation by experiments.

BL – Bloom's Taxonomy Levels
(L1-Remembering, L2-Understanding, L3-Applying, L4-Analysing, L5-Evaluating, L6-Creating)

PART- A(10x2=20Marks)
(Answer all Questions)

Q.No	Questions	Marks	CO	BL
1	Write a short note on the effects of loading in measuring instrument	2	CO1	L2
2	A 0-250 V voltmeter has a guaranteed accuracy of 2% of full-scale reading. The voltage measured by the voltmeter is150 volts. Determine the limiting error in percentage.	2	CO1	L2
3	Write short note on Eddy current damping system in electrical measuring instruments	2	CO2	L2
4	Differentiate between moving coil, moving iron electro dynamometer and induction type measuring instruments.	2	CO2	L2
5	List the sources of errors in a Kelvin Double Bridge that may affect its precision while measuring low range resistances.	2	CO3	L2
6	The four impedances of a bridge are $Z_1 = 400\ \Omega - 50°$, $Z_2 = 200\ \Omega - 30°$, $Z_3 = 800\ \Omega - 50°$, $Z_4 = 400\ \Omega - 40°$. Find out whether the bridge is balanced under these conditions.	2	CO3	L2
7	List out the merits and demerits of Electromagnetic flow meter	2	CO4	L1
8	Define an integrated smart sensor system	2	CO4	L1
9	State the principle used to measure the unknown frequency of an analog signal	2	CO5	L1
10	Differentiate between Flash, Sigma-Delta ADC and Successive approximation type ADCs	2	CO5	L2

PART- B(5x 13=65Marks)

Q.No	Questions	Marks	CO	BL
11 (a)	Describe the static and dynamic characteristics of a measuring instrument	13	CO1	L3
	OR			
11 (b) (i)	Discuss the statistical evaluation of measurement data with Gaussian distribution curve	8	CO1	L3
(ii)	Three resistors have the following ratings: R1 = 47 W ± 4%, R2 = 65 W ± 4%, R3 = 55 W ± 4%. Determine the magnitude and limiting	5	CO1	L3

	errors in ohms and in percentage of the resistance of these resistors connected in series.			
12 (a)	A PMMC voltmeter with a resistance of 20 Ω gives a full scale deflection of 120° when a potential difference of 100 mV is applied across it. The moving coil has dimensions of 30 mm × 25 mm and is wound with 100 turns. The control spring constant is 0.375 × 10-6 N-m/degree. Find the flux density in the air gap. Find also the dimension of copper wire of coil winding if 30% of the instrument resistance is due to coil winding. The specific resistance of copper is 1.7 × 10-8 Ω m.	**13**	CO2	L3
	OR			
12 (b)	Explain the construction and working of moving iron ammeter with neat diagram. Derive the equation for deflection torque and discuss the effects of different torques on the moving iron ammeter.	**13**	CO2	L3
13 (a)	In a Maxwell's inductance comparison bridge, the arm AB consists of a coil with inductance L1 and resistance r1 in series with a non-inductive resistance R. Arm BC and CD are each a non-inductive resistance of 100 Ω. Arm AD consists of standard variable inductor L of 32.7 Ω resistance. Balance is obtained when L2 = 47.8 m H and R = 1.36 Ω. Find the resistance and inductance of the coil in the arm AB.	**13**	CO3	L3
	OR			
13 (b)	Draw the configuration of Schering's Bridge and draw the phasor diagram at balanced condition	**13**	CO3	L3
14 (a) (i)	Explain the method of measurement of temperature using thermocouple with neat diagram.	**7**	CO4	L3
(ii)	The resistance of a thermistor is 800 Ω at 50°C and 4 kΩ at the ice-point. Calculate the characteristic constants (A, B) for the thermistor and the variations in resistance between 30°C and 100°C	**6**	CO4	L5
	OR			
14 (b)	Explain the method to measure the pressure using bellows as primary transducer and differential transformer as the secondary transducer	**13**	CO4	L3
15 (a)	Describe the working of Ramp and Dual slope Integrating type Digital Voltmeter	**13**	CO5	L3
	OR			
15 (b) (i)	Describe the working of Digital storage Oscilloscope with neat diagram	**13**	CO5	L3

PART- C(1x 15=15Marks)

(Q.No.16 is compulsory)

Q.No	Questions	Marks	CO	BL
16.	Four arms of a Wheatstone bridge are as follows: AB = 100 Ω, BC = 10 Ω, CD = 4 Ω, DA = 50 Ω. A galvanometer with internal resistance of 20 Ω is connected between BD, while a battery of 10-V dc is connected between AC. Find the current through the galvanometer. Find the value of the resistance to be put on the arm DA so that the bridge is balanced.	**15**	CO3	L5