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**B.E. / B.TECH. DEGREE EXAMINATION, MAY 2023**

Fifth Semester

**EC18007- MEASUREMENTS AND INSTRUMENTATION***(Electronics and Communication Engineering)***(Regulation 2018 / Regulation 2018A)****TIME: 3 HOURS****MAX. MARKS: 100**

COURSE OUTCOMES	STATEMENT	RBT LEVEL
CO 1	To acquire knowledge on Basics of Measurements.	4
CO 2	To understand the fundamentals concepts of Analog Instruments.	4
CO 3	To understand the fundamentals concepts of Digital Instruments	4
CO 4	To acquire the knowledge on application of sensors for physical quantity measurement.	3
CO 5	To understand the recent developments in sensors	3

**PART- A (10 x 2 = 20 Marks)**

(Answer all Questions)

	STATEMENT	CO	RBT LEVEL
1.	Distinguish clearly between accuracy and precision.	1	2
2.	A 0-150V voltmeter reads 90V, find the percentage limiting error if the instrument has the limiting error of 1%. Find the limiting error if the meter reads 70V.	1	4
3.	Why dynamometer type instruments are not usually for used for dc measurements?	2	2
4.	Explain the principle of analog type electrical instruments?	2	2
5.	A digital voltmeter has a read out range from 0-9999 counts. Determine the resolution of the instrument in volt when the full scale reading is 9.999V?	3	4
6.	Write any two advantages and disadvantages of digital voltmeter?	3	2
7.	Compare Thermistors and Thermocouples?	4	2
8.	A thermistor used for temperature measurement has $\beta = 3140$ K and the resistance at 27 °C is 1050 $\Omega$ . If the resistance of the thermistor is measured as 2330 $\Omega$ , find the temperature.	4	4
9.	What are materials used in MEMS manufacturing?	5	2
10.	Give any two applications of smart sensors	5	2

**PART- B (5 x 14 = 70 Marks)**

	QUESTION	Marks	CO	RBT LEVEL
11. (a)	(i) Explain the static and dynamic characteristics of measurement system in detail.	(8)	1	4
	(ii) A resistance is measured by voltmeter ammeter method. Ammeter shows 283.5 mA on a 500 mA scale and the voltmeter shows 96.1234 V on a 250 V range. Both ammeter and voltmeter are guaranteed to be accurate within $\pm 1\%$ of full scale reading. Find the indicate value of resistance and the limiting error within which you can guarantee the result	(6)	1	4
	<b>(OR)</b>			
(b)	(i) Discuss the different types of standards of measurement.	(8)	1	4
	(ii) Define limiting error? Determine the limiting error (in percent) in case of an instrument reading of 83 V with 0-150 V voltmeter having a guaranteed accuracy of 1% full scale reading.	(6)	1	4
12. (a)	(i) Describe the construction and working of a Permanent Magnet moving Coil instrument.	(7)	2	4
	(ii) A PMMC instrument has a coil of dimensions 10 mm x 8 mm. The flux density in the air gap is 0.15 Wb/m <sup>2</sup> . If the coil is wound for 100 turns, carrying a current of 5 mA then calculate the deflecting torque. Calculate the deflection if the spring constant is $0.2 \times 10^{-6}$ Nm/degree.	(7)	2	4
	<b>(OR)</b>			
(b)	Illustrate the construction and principle of shaded pole type induction ammeter. Draw the vector diagram showing the relation between current and fluxes and bring out the expression for torque of an induction type shaded pole ammeter.	(14)	2	4
13. (a)	Define harmonic distortion and total harmonic distortion. Explain the parts of a fundamental suppression Harmonic distortion analyzer, its working and its advantages	(14)	3	4

**(OR)**

- (b) (i) Illustrate the working of Integrating type digital Voltmeter. (7) 3 4  
 (ii) Elaborate in detail about how the power is measured in three phase power factor meter with unity, lag and leading power factors. (7) 3 4
14. (a) (i) Explain the construction and working of bimetallic strip. (7) 4 4  
 (ii) What is the working principle of Pirani Gauge? Explain its construction and working. (7) 4 4
- (OR)**
- (b) (i) What is the working principle of Thermocouples? How the Thermocouples are classified explain in detail? (7) 4 4  
 (ii) What is Rogowski coil? Explain its working and also mention its applications? (7) 4 4
15. (a) What is MEMS? What are the different types of MEMS? Explain any two applications of MEMS in detail? (14) 5 3
- (OR)**
- (b) What is Nano Sensor and how it works? And also explain its uses and applications? (14) 5 3

**PART- C (1 x 10 = 10 Marks)**

(Q.No.16 is compulsory)

- |   | Marks       | CO | RBT<br>LEVEL |
|---|-------------|----|--------------|
| 16. A set of independent 10 measurements were made to determine the weight of a lead shot. The weights in gram were:<br><b>1.570,1.597,1.591,1.562,1.577,1.580,1.564,1.586,1.550,1.575.</b><br>Evaluate the<br>i)Arithmetic Mean<br>ii)Average deviation<br>iii)Standard Deviation<br>iv)variance<br>v)Probable error of one reading<br>vi)probable error of the mean | <b>(10)</b> | 1  | <b>5</b>     |