Reg. No. : | | | | | | | | | | | | |

Question Paper Code:R3B05

B.E./B.Tech. DEGREE EXAMINATION, NOV 2024

Third Semester

Biomedical Engineering

R21UBM305-SENSORS AND MEASURING TECHNIQUES

(Regulations R2021)

Duration: Three hours Maximum: 100 Marks

Answer All Questions

PART A - (10 x 2 = 20 Marks)

1.	Distinguish between threshold and resolution of a transducer.	CO1-U
2.	What is the significance of calibration?	CO1-U
3.	Mention any few biomedical applications of strain gauge.	CO1-U
4.	A thermistor has a resistance temperature coefficient of -5% over a temperature range of 25^0C to 50^0C. If the resistance of the thermistor is 100Ω at 25^0C, what is the resistance at 35^0C?	CO2-App
5.	Differentiate photovoltaic and photo conductive cells.	CO1-U
6.	Compare MEMS sensors and Nano Sensors.	CO1-U
7.	Name the bridge used to measure the high Q coils.	CO1-U
8.	The four arms of Wheatstone bridge as follows: AB = 5 kΩ; BC =? ; CD = 10 Ω; DA = 2 kΩ. What should be the resistance in the arm for no current through the Galvanometer?	CO2-App
9.	Name two types of analog to digital converters used in DVM design.	CO1-U
10.	Differentiate between CRO & DSO.	CO1-U

PART – B (5 x 16= 80Marks)

11.	(a)	(i) Explain the basic functional blocks of a measuring system with necessary diagrams.	CO1-U	(8)
		(ii) Discuss in detail various types of errors associated in measurement and how these errors can be minimized?	CO1-U	(8)

Or

	(b)	(i)	Discuss in detail the various static characteristics of a measuring system.	CO1-U	(8)
		(ii)	The following values were obtained from the measurements of the value of EMF (in volts) : 3.525, 3.510, 3.531, 3.544, 3.562, 3.570, 3.558, 3.586, 3.591, 3.549. Determine the Arithmetic mean, Average Deviation, Standard Deviation and Variance.	CO1-U	(8)
12.	(a)	(i)	Describe the working principle and characteristics of thermocouple. Also explain the Cold junction compensation in Thermocouple.	CO1-U	(12)
		(ii)	List out the applications and limitations of LVDT.	CO1-U	(4)
			Or		
	(b)	(i)	Describe the working principle and compensation techniques of RTD.	CO1-U	(12)
		(ii)	Classify the different types of Strain gauges.	CO1-U	(4)
13.	(a)	(i)	Explain in detail the working of Photo Multiplier Tube and give its biomedical applications.	CO1-U	(8)
		(ii)	Explain the principle of Nano sensors.	CO1-U	(8)
			Or		
	(b)	(i)	Briefly explain the working of photo conductive cells and give the spectra-photometric applications of photoconductive cells.	CO1-U	(8)
		(ii)	Explain the working principle of Digital Transducer with neat sketch.	CO1-U	(8)
14.	(a)	(i)	What are the different problems associated with the measurement of low resistance? With necessary illustrations explain the working principle of Kelvin's double bridge.	CO1-U	(8)
		(ii)	The arms of an a.c. Maxwell bridge are arranged as follows: AB is a non-inductive resistance of 1,000Ω in parallel with a capacitor of capacitance 0.5μF, BC is a non-inductive resistance of 600Ω CD is an inductive impedance (unknown) and DA is a non-inductive resistance of 400Ω. If balance is obtained under these conditions, find the value of the resistance and the inductance of the branch CD.	CO2-App	(8)
			Or		
	(b)	(i)	Describe the working of Function generator.	CO1-U	(8)
		(ii)	In a balanced network, AB is a resistance of 500 ohm in series with an inductor of 0.18H, BC and DA are non-inductive resistances of 1 k ohm each and CD consists of a resistance R in series with a capacitor C. A potential difference of 5 V at a frequency of $5000/2\pi$ is applied between points A and C.	CO2-App	(8)

Determine the values of R and C.

15.	(a)	(i) Explain the block diagram of dual slope type DVM.	CO1-U	(8)
		(ii) Draw the block diagram of CRO and explain the function of each block.	CO1-U	(8)
		Or		
	(b)	(i) Develop a neat block diagram of X-Y recorder and describe its working.	CO1-U	(8)
		(ii) elate and contrast the working, advantages and disadvantages of LED and LCD.	CO1-U	(8)