Enrolment No./Seat No_____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE- SEMESTER–IV (NEW) EXAMINATION – WINTER 2024

Subject Code:3140312 Date:26-11-2024

Subject Name:Biomedical Sensors & Transducers

Time:02:30 PM TO 05:00 PM Total Marks:70

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**
4. **Simple and non-programmable scientific calculators are allowed.**

			MARKS
Q.1	**(a)**	Explain the following terms: 1) Measuring range 2) True value 3) Relative value.	**03**
	(b)	What is error? Explain it with its types.	**04**
	(c)	Explain dynamic characteristics of measuring instruments.	**07**
Q.2	**(a)**	Define transducer efficiency.	**03**
	(b)	Explain the Photoresistor with its working principle, construction and applications.	**04**
	(c)	Explain working principle of thermocouple with its basic diagram.	**07**
		OR	
	(c)	Draw and explain basic construction of Optoisolator. Explain working principle. Enlist applications.	**07**
Q.3	**(a)**	Enlist and explain advantages and disadvantages of photodiode.	**03**
	(b)	What is radiant temperature sensors? Explain its working principle.	**04**
	(c)	Explain resistance temperature detector (RTD) with its working principle and construction.	**07**
		OR	
Q.3	**(a)**	What is resistive transducers? List out its applications.	**03**
	(b)	Example: A resistance strain gauge with a gauge factor of 4 is cemented to a steel member, which is subjected to a strain of 2×10^{-6}. If the original resistance value of the gauge is 160 Ω, calculate the change in resistance.	**04**
	(c)	Draw and explain construction and circuit diagram of linear variable differential transformer.	**07**
Q.4	**(a)**	Enlist and explain biomedical applications of strain gauge.	**03**
	(b)	What is Wheatstone bridge? Draw circuit for the measurement of resistance. Derive the equation for equilibrium of bridge.	**04**
	(c)	Explain piezo-electric transducer. Derive the equation for output voltage and sensitivity.	**07**
		OR	
Q.4	**(a)**	Explain the relation between pulse repetition frequency and flow velocity in pulsed wave Doppler shift transducers.	**03**
	(b)	Example: A certain crystal has a coupling coefficient of 0.42. How much electrical energy must be applied to produce an output of 6 oz.in. of mechanical energy?	**04**
	(c)	Draw and explain construction of catheter tip pressure sensor.	**07**
Q.5	**(a)**	Explain Newtonian and Non-Newtonian fluid with its properties and examples.	**03**
	(b)	Explain un-bonded strain gauge with its advantages and disadvantages.	**04**
	(c)	Draw and explain construction of capacitive type pressure sensor.	**07**

OR

Q.5	**(a)**	Enlist and explain kinds of body motions generated by muscular activities are objects of motion measurements.	**03**
	(b)	Write a note on intraocular pressure monitoring.	**04**
	(c)	Explain how mean blood pressure can be measured with Doppler Ultrasound.	**07**

****