

**GUJARAT TECHNOLOGICAL UNIVERSITY**

BE - SEMESTER– IV (New) EXAMINATION – WINTER 2019

**Subject Code: 2140306****Date: 13/12/2019****Subject Name: Biosensors & Transducers****Time: 10:30 AM TO 01:00 PM****Total Marks: 70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

		MARKS
Q.1	(a) Explain functioning of Chemoreceptors in Human body.	03
	(b) Define Transducer, Sensor and Actuator with example.	04
	(c) Explain Thermistor & Thermocouple transducer for body temperature measurement.	07
Q.2	(a) Draw construction of Ionization chamber & explain its working principle for nuclear radiation detection.	03
	(b) Explain any four static characteristics of Transducer.	04
	(c) Derive the equation of Guage factor for Resistive strain gauge. Explain Resistive strain gauges with its applications.	07
<b>OR</b>		
	(c) Explain any two types of capacitive transducers with its working principle & applications.	07
Q.3	(a) Write a short note on Pyroelectric thermal sensor.	03
	(b) A strain guage is bonded to a beam of 0.15 m long and has a cross sectional area of 4 cm <sup>2</sup> . Young's modulus for steel is 207 GN/m <sup>2</sup> . The strain guage has an unstrained resistance of 250 Ω and a guage factor of 2.2. When a load is applied, the resistance of guage changes by 0.015 Ω. Calculate the change in length of the steel beam and the amount of force applied to the beam.	04
	(c) Explain any two types of inductive transducers with its working principle & applications.	07
<b>OR</b>		
Q.3	(a) Explain construction & working of Photomultiplier cell for radiation detection.	03
	(b) Calculate the voltage generated across the electrodes of an electromagnetic blood flow probe applied across a blood vessel of 2 cm diameter. The magnetic flux density of probe is 1.5x10 <sup>-5</sup> wb/m <sup>2</sup> . Assume volume flow rate of 180 cm <sup>3</sup> /sec.	04
	(c) Enlist & explain various transducers for liquid level measurement.	07
Q.4	(a) Enlist various chemical transducers for the measurement of ions & dissolved gases.	03
	(b) Explain construction of ISFET for glucose measurement.	04
	(c) Explain construction & working of pCO <sub>2</sub> electrode for blood pCO <sub>2</sub> measurement.	07
<b>OR</b>		
Q.4	(a) Write a short note on Half-cell Potential.	03
	(b) What is pH? Explain pH measurement technique.	04
	(c) Explain construction & working of pO <sub>2</sub> electrode for blood pO <sub>2</sub> measurement.	07
Q.5	(a) Explain Potentiometric transducer for linear & angular displacement measurement.	03
	(b) Explain indirect method of Blood pressure measurement.	04

(c) Write a short note on Smart sensors. **www.FirstRanker.com** **www.FirstRanker.com**  
**07**

**OR**

- Q.5** (a) Write a short note on Hall effect transducer. **03**  
(b) Define Pneumotachometer. Explain basic working principle of Pneumotachometer. **04**  
(c) Explain types of Thin film sensors in detail. **07**

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