

**GUJARAT TECHNOLOGICAL UNIVERSITY**  
**BE - SEMESTER-IV (NEW) EXAMINATION – SUMMER 2022**

**Subject Code:3140312****Date:02-07-2022****Subject Name:Biomedical Sensors & 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.
4. Simple and non-programmable scientific calculators are allowed.

	<b>MARKS</b>
<b>Q.1</b> (a) Explain following terms: Measurement, Calibration and Measurand	<b>03</b>
(b) Explain difference between Sensor, Transducer and Actuator with example.	<b>04</b>
(c) Explain working of intravascular fiber optic pressure transducer with necessary schematic.	<b>07</b>
<b>Q.2</b> (a) What is seebeck effect? Which type of thermocouple (Metal Pair) has highest sensitivity? Which type of temperature sensor has highest linearity?	<b>03</b>
(b) Explain thermistor linearization circuit.	<b>04</b>
(c) A nickel wire RTD has 100 ohm resistance at 0 degree Celsius. If the diameter of the Wire used is 0.002 mm, find the length of the wire element. The resistance temperature co-efficient and the resistivity of nickel are 0.0068 /C and $8.7 \times 10^{-6}$ ohm-cm respectively. Calculate Its resistance at steam point when used in a central autoclave of a hospital.	<b>07</b>
<b>OR</b>	
(c) Explain working principle, construction and transduction circuits of Resistance temperature detectors (RTD).	<b>07</b>
<b>Q.3</b> (a) Enlist advantages and disadvantages of LVDT.	<b>03</b>
(b) Explain working principle of Solar Cells and Phototransistors with necessary schematic	<b>04</b>
(c) Enlist biomedical applications of strain Gages. Explain any one with necessary diagram.	<b>07</b>
<b>OR</b>	
<b>Q.3</b> (a) Draw and explain wheatstone bridge circuit.	<b>03</b>
(b) Explain working principle of Photothyristors and Optoisolator with necessary schematic.	<b>04</b>
(c) Enlist displacement transducers. Draw and explain schematic of pressure measurement with the help of displacement transducers.	<b>07</b>
<b>Q.4</b> (a) What are the units of flow? Explain types of flows in physiological System.	<b>03</b>
(b) Explain working of doppler Frequency shift blood flow transducer.	<b>04</b>
(c) Draw and explain Intraocular pressure monitoring system.	<b>07</b>
<b>OR</b>	
<b>Q.4</b> (a) What are the units of pressure? Give physiological parameters pressure ranges.	<b>03</b>
(b) Explain schematic of any angular velocity transducer.	<b>04</b>

- (c) Explain working principle and schematic diagram of any differential pressure flow transducers. **07**
- Q.5** (a) Draw schematic of Amperometric chemical Sensor. **03**  
(b) Write a short note on any electrochemical gas Sensor. **04**  
(c) Explain noncontact type measurement of displacement and rotation. **07**
- OR**
- Q.5** (a) Explain Beer-Lambert law with its applications in Biomedical field. **03**  
(b) Explain principle of the pulse oximetry functioning. **04**  
(c) Explain contact type measurement of displacement and rotation. **07**

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