

# GUJARAT TECHNOLOGICAL UNIVERSITY

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

**Subject Code:3140312**

**Date:01-07-2024**

**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.

- Q.1** (a) Define the following terms: 1) Sensitivity 2) Accuracy 3) Resolution **03**  
(b) Explain the classification of transducer in detail. **04**  
(c) Draw and explain the general block diagram scheme of instrumentation system. **07**

- Q.2** (a) Draw and explain the principle of phototransistor. **03**  
(b) A thermistor probe material has constant  $B = 4500K$ . When used for body temperature measurement, its resistance is measured 90 ohms at 37 degree Celsius. Determine its resistance at 25 degree Celsius. Also, calculate the value of parallel linearizing resistor, if the temperature range of the thermistor probe is 100 degree Celsius. **04**  
(c) Explain in detail the Beer Lambert's Law with neat diagram. **07**

**OR**

- (c) What is cold junction compensation (CJC)? Explain various techniques for CJC. **07**

- Q.3** (a) Describe the variable area type flow meter in detail. **03**  
(b) Explain the principle of operation of PW ultrasonic velocimetry. **04**  
(c) Draw and explain the construction and working of LVDT in detail with its merits, demerits and applications. **07**

**OR**

- Q.3** (a) Explain different types of flows associated with biomedical engineering. **03**  
(b) With neat diagram, discuss how ultrasound propagates in tissue? **04**  
(c) Write a note on principle of electromagnetic type blood flow meter. **07**

- Q.4** (a) Enlist the differences between intracranial and intraocular pressure monitoring. **03**  
(b) Explain the working of catheter-tip type sensor for the measurement of Intra-vascular pressure. **04**  
(c) Draw and explain the design of strain gage bridge for measurement of pressure. **07**

**OR**

- Q.4** (a) Define different physiological pressure ranges and measurement sites. **03**  
(b) Describe the displacement and rotation measurements by contact sensors. **04**  
(c) Write a note on fiber optic blood pressure transducers with necessary schematics. **07**

- Q.5** (a) Define the ion selective electrodes and its operation. **03**  
(b) Describe the Half-cell Potential with diagram. **04**  
(c) Draw and explain the electrodes for measurement of pCO<sub>2</sub> in detail. **07**

**OR**

- Q.5** (a) Define the pH of blood. **03**  
(b) Describe the construction of glass electrode for pH measurement. **04**  
(c) Draw and explain the operation and construction of reference electrodes. **07**

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