

**GUJARAT TECHNOLOGICAL UNIVERSITY**B.E. Sem-V<sup>th</sup> Examination December 2010**Subject code: 150302****Subject Name: Biomedical Transducers****Date: 15 /12 /2010****Time: 03.00 pm - 05.30 pm****Total Marks: 70****Instructions:**

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

- Q.1** (a) (i) Define: (1) transducer (2) accuracy (3) precision **03**  
(ii) Explain Electrical design characteristics for transducers **04**  
(b) Explain LVDT in detail. **07**
- Q.2** (a) Explain any two types of strain gauges. **07**  
(b) Explain Resistive, Inductive & Capacitive transducer. **07**
- OR**
- (b) Explain Diaphragm type capacitive transducer. **07**
- Q.3** (a) Write short note on RTD. **07**  
(b) Explain GM counter & Scintillation counter with diagram. **07**
- OR**
- Q.3** (a) Short note on Thermocouples. **07**  
(b) Explain Polarographic Clark  $po_2$  sensor & Transcutaneous  $po_2$  sensor. **07**
- Q.4** (a) Explain Electromagnetic blood flow meter. **07**  
(b) Calculate the series resistance & frequency response of a potassium chloride filled micro electrode if the pipette radius is  $0.2 \mu m$  & inside tip radius is  $0.15 \mu m$ .  $\rho$  for KCL is  $3.7 \text{ ohm-cm}$  & taper angle is  $1/180$ . Dielectric constant of glass is 4. The electrode is immersed 3 cm deep in electrolyte. **07**
- OR**
- Q.4** (a) Short note on Ultrasonic blood flow transducer. **07**  
(b) The output of a piezoelectric transducer is to be observed on a CRO of  $1M\Omega$  resistance in parallel with a capacitance of  $10^{-10} \text{ F}$  across its input terminals. The crystal is deformed in its thickness by  $10^{-3} \text{ mm}$  with frequency  $200 \text{ Hz}$ . Find the amplitude of the output voltage as measured on the CRO. Charge constant of crystal is  $4 \times 10^{-6} \text{ C/cm}$ . capacitance of crystal is  $10^{-9} \text{ F}$  & capacitance of connecting cable is  $2.85 \times 10^{-10} \text{ F}$ . **07**
- Q.5** (a) Explain ECG, EMG, and EEG Electrodes. **07**  
(b) Explain phonocardiograph with diagram. **07**
- OR**
- Q.5** (a) Write a short note on Microbial Biosensors. **07**  
(b) Explain polarizable & non-polarizable electrodes. **07**

\*\*\*\*\*