

GANPAT UNIVERSITY

B. Tech. Semester: III Biomedical & Instrumentation Engineering

Regular Examination November – December 2013

2BM303: Biomedical Transducers & Biosensors

Time: 3 Hours

Total Marks: 70

Instruction:

1. All the questions are compulsory.
2. Answer of each section must be written in separate answer books.
3. Figure to the right indicate marks.
4. Assume data, if needed.
5. Conventional terms / notations are used.

Section - I

- Que. – 1 12
- a) Draw the block diagram of basic instrumentation system and explain.
 - b) Define : 1). Accuracy 2). Precision 3). Calibration
4). Artifacts 5). Significant figures 6). Transducer

OR

- Que. – 1 12
- a) Discuss the following static performance characteristics of biological transducers:
 - (i). Zero shift and Sensitivity shift
 - (ii). Friction and Hysteresis.
 - (iii). Non- Linearity and Resolution.
 - b) Discuss the electrical design characteristics of Transducers.

- Que. – 2 11
- a) Describe the transduction principles commonly used in the design of resistive types of transducers.
 - b) Write notes on Metal wire strain gauge.

OR

- Que. – 2 11
- a) Discuss the design of different types of electrodes used for ECG monitoring.
 - b) What is PH? Draw the diagram of Ph Electrode and explain.

- Que. – 3 Answer any three. 12
- a) Explain micro electrodes.
 - b) Discuss Electrode-Electrolyte interface.
 - c) Write note on: Enzyme based glucose biosensors
 - d) Draw and explain PCO₂ electrode giving neat diagram.

Section – II

Que. – 4 12

- (a) What is seeback effect for thermocouple? Give the construction, type, material used and criterion of choice of material for Thermo Couple.
- (b) A nickel wire RTD has 100 ohm resistance at 0° C. If the diameter of the wire used is 0.002mm, find the length of the wire element. The resistance temperature co-efficient and resistivity of nickel are $0.0068^{\circ}\text{C}^{-1}$ and 8.7×10^{-6} Ohm-cm respectively. Calculate its resistance at steam point when used in a central autoclave of a hospital.

OR

Que. – 4 12

- (a) Explain all the thermo electric law of thermo couple.
- (b) What is RTD? Explain its working principle with the characteristics of RTD metals.

Que. – 5 11

- a). What is displacement? Explain construction, working, merits and demerits of LVDT with necessary diagrams.
- b). Write a note on Piezoelectric materials.

OR

Que. – 5 11

- a). Give classification of capacitive displacement transducer. Explain any one of it.
- b). Derive equation for output of a Piezoelectric crystal.

Que. – 6 Answer any three. 12

- a). What is diaphragm? Explain any one of the diaphragm transducer.
- b). Explain various form of thermistor with advantages and disadvantages.
- c). Draw and explain construction of Piezoelectric Ultrasound transducer.
- d). Write a short note on Shaft Encoder.

END OF PAPER