

PARUL UNIVERSITY
FACULTY OF ENGINEERING & TECHNOLOGY
B.Tech. Summer 2022-23 Examination

Semester: 4
Subject Code: 203111253
Subject Name: Biosensor and Transducers

Date: 22/03/2023
Time: 2:00pm to 4:30pm
Total Marks: 60

Instructions:

1. All questions are compulsory.
2. Figures to the right indicate full marks.
3. Make suitable assumptions wherever necessary.
4. Start new question on new page.

Q.1 Objective Type Questions - (Fill in the blanks, one word answer, MCQ-not more than Five in case of MCQ) (All are compulsory) (Each of one mark) (15)

1. Closeness with which measurement approaches true value is known as
 - a) Accuracy
 - b) Precision
 - c) Conformance
 - d) Resolution
2. Which one of the following characteristics is considered at the time of electrical design?
 - a) Excitation
 - b) Impedance
 - c) output
 - d) All of the above
3. In doppler effect based ultrasonic meter, the velocity of the blood flow is proportional to _____
 - a) Difference in frequency
 - b) Difference in ultrasound velocity
 - c) Difference in velocity of blood flow
 - d) Direction of ultrasonic beam
4. What is the pressure of cerebrospinal fluid in intracranial space?
 - a) <8 mmHg
 - b) 10-20 mmHg
 - c) <30 mmHg
 - d) <37 mmHg
5. Which one of following use for non-contact temperature measurement?
 - a) Thermocouple
 - b) Thermistor
 - c) Pyrometer
 - d) RTD
6. Enlist the types of scale error.
7. MEMS Stand for_____.
8. Define measurement.
9. Enlist the application of capacitive transducer.
10. Thermistor have one cold junction. (True/False)
11. Sodium sulphate is a piezoelectric material (True/False).
12. Oscillometric is a one type of non-invasive technique to measure blood pressure (True/False).
13. Write the final equation for ultrasonic doppler shift blood flow meter technique.
14. Enlist the types of noise.
15. Define biochemical sensor.

Q.2 Answer the following questions. (Attempt any three) (15)

- A) Draw and Explain block diagram of a generalized instrumentation scheme.
- B) Calculate the voltage generated across the electrodes of an electromagnetic blood flow probe flow probe applied across a blood vessel of 1.8 cm diameter. The magnetic flux density of the probe is 1.6×10^{-5} wb/m². Assume volume flow rate of 200 cm³/sec. .
- C) Write a short note on Enzyme based glucose sensor.
- D) Draw & explain Transient time Ultrasonic blood flow transducer and derive necessary equation for it.

- Q.3**
- A) Explain the construction and working principle of LVDT with the help of a neat diagram. Draw the input- output characteristics of LVDT. Mention its advantages and limitations. (07)
 - B) Explain working of Ag/AgCl electrode. (08)

OR

B) What is piezoresistive effect? Derive expression for gauge factor. Give one application of strain gauge transducer in biomedical field. **(08)**

Q.4 A) Explain **(07)**

- (1) ECG Electrodes
- (2) EMG Electrodes
- (3) EEG Electrodes.

OR

A) What do you understand by transduction? Explain any six transduction principles. **(07)**

B) Give the difference between sensors and Transducer with its merits & demerits. **(08)**