

II B.Tech. II Semester Regular Examinations, April/May -2005
BIO-TRANSDUCERS AND APPLICATIONS
(Bio-Medical Engineering)

Time: 3 hours

Max Marks: 80

Answer any FIVE Questions
All Questions carry equal marks

1. Explain the following characteristics
 - (a) Linearity
 - (b) Accuracy
 - (c) Range
 - (d) Frequency response
2. What is thermistor? Give the basic science of the thermistor with circuit symbols and packing style. A thermistor has a positive temperature coefficient of $+0.002\Omega / \Omega / ^\circ\text{C}$ at 25°C . What is its resistance at 98.6°C if the normal resistance is $12.1\text{k}\Omega$?
3.
 - (a) Write note on chemical thermometry.
 - (b) Explain the terms:
 - i. Radiation thermometry.
 - ii. Clinical thermometry
4. Derive an expression for the gauge factor of resistive type of strain gauge. Describe the applications of displacement transducer in biomedical engineering.
5. Write short notes on
 - (a) Elastic transducer
 - (b) Capacitive transducer.
 - (c) Optical transducer.
6. How do you measure blood pressure? What are the methods and explain them in brief?
7. Describe Pascal principle and how can be related to physiological blood flow.
8.
 - (a) Describe the role of telemetry in medicine.
 - (b) Explain operation amplifier with block diagram.

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1. (a) Define noise?
(b) Define about the sampling errors?
(c) Explain active and passive transducer?
2. What is thermograph? Describe in detail with thermo graphic unit for medical use. How it can be used in determination of disease?
3. (a) Write note on chemical thermometry.
(b) Explain the terms:
 - i. Radiation thermometry.
 - ii. Clinical thermometry
4. (a) Explain working principles of various inductive transducers.
(b) A thin constantan wire stretched taut has a length of 30mm and a cross sectional area of 0.01mm^2 the resistance is $1.5\ \Omega$. The force applied to the wire is increased such that the length is increased by 10 mm and the cross-sectional area decreases by 0.0027mm^2 find the change in resistance.
5. Write short notes on
 - (a) Elastic transducer
 - (b) Capacitive transducer.
 - (c) Optical transducer.
6. List different methods used for measurement of pressure in an organism. Explain any one method with necessary schematic.
7. What is the use of dilution technique in medical diagnosis? Describe thermo dilution method.
8. (a) Explain the transmission of biological data through radio telemetry.
(b) Explain in detail any two concrete application of telemetry in the field of medicine.

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1. Explain the following characteristics
 - (a) Linearity
 - (b) Accuracy
 - (c) Range
 - (d) Frequency response
2. Describe the difference between deflection and null type circuits giving suitable examples
3. Explain the method of linearization in a thermistor thermometer. With a neat circuit diagram explain the linearized thermistor temperature measuring circuit.
4. Derive an expression for the gauge factor of resistive type of strain gauge. Describe the applications of displacement transducer in biomedical engineering.
5. Write short notes on
 - (a) Elastic transducer
 - (b) Capacitive transducer.
 - (c) Optical transducer.
6. With a neat diagram explain about a piezoelectric transducer. Also explain how it can be used as an arterial pressure sensor?
7. What is dilution technique? Describe the Fick, Dye and thermo dilution method.
8. What is a differential amplifier show a circuit symbol and the input output relation what is the unique property of the differential amplifier.

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1. (a) Define noise?
(b) Define about the sampling errors?
(c) Explain active and passive transducer?
2. Describe the principle behind thermocouple. Explain the circuit used in compensating the reference junction in thermocouple?
3. (a) Write note on chemical thermometry.
(b) Explain the terms:
 - i. Radiation thermometry.
 - ii. Clinical thermometry
4. (a) Explain the principle of a strain gauge
(b) Derive the gauge factor of a strain gauge.
5. (a) Explain in detail the diaphragm displacement pressure transducer.
(b) Give a detailed account of translational accelerometers.
6. Define mean arterial blood pressure. Explain pressure gradient technique with circuit diagram?
7. Explain the physical principle behind optical transducers? Explain the principle behind square wave Quadrature suppression electronic system with block diagram and waveforms.
8. Design an oscillator (F.M), which is used to transmit biological data.
