

GANPAT UNIVERSITY

B.TECH SEM. III BIOMEDICAL & INSTRUMENTATION ENGINEERING

REGULAR EXAMINATION NOVEMBER / DECEMBER - 2012

2BM303: BIOMEDICAL TRANSDUCERS AND BIOSENSORS

TIME : 3 HOURS

TOTAL MARKS: 70

INSTRUCTION:

1. Write each section in separate answer books.
2. All questions are compulsory.
3. Draw figures and assume data wherever necessary.
4. Conventional terms / notations are used.
5. Figure to the right indicate marks.

Section – I

Q.1

- a) Explain metal wire type strain gauge transducer with neat and labeled diagram. [12]
(6)
- b) State and Describe the following dynamic characteristics and show it on the response characteristic graph of transducer. (4)
- c) Define: 1) Gross error 2) Random error (2)

OR

Q.1

- a) Explain the following transduction principles: [12]
(6)
 - 1) Ultrasonic transduction
 - 2) Electromagnetic digital transduction principle
- b) Write a note on piezoelectric microphone and force plate transducer (6)

Q.2

- a) Obtain the expression and draw circuit for four active arm strain gauge bridge circuit (5)
- b) A thermocouple is calibrated for the temperature range of 0°C to 400°C and maximum thermo emf produced is 20.75 mV with respect to ice-bath. When the same instrument is used at atmospheric temperature of 25°C, the voltmeter shows 10.5 mV. Determine the actual temperature of measuring junction. (4)
- c) Define: (i) Young's modulus (ii) poisson's ratio (2)

OR

Q.2

- a) Define catheter. Draw and explain catheter tip type blood pressure transducer using strain gauge (5)
- b) Derive the output voltage expression for piezoelectric crystal. $V = g.t.p.$ explain each term of this expression (4)
- c) Distinguish between active and passive transducer (2)

Q.3 Write short note on (Any three)

- a) Thermistor probes and linearization circuit
 - b) PN junction diode and transistor
 - c) Bridge balancing circuit of strain gauge
 - d) Infrared temperature probes
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Section – II

- Q.4** [12]
a). Variable separation differential capacitive type displacement transducer.
b). Draw and explain types of diaphragm arrangement.

OR

- Q.4** [12]
a). Explain single capacitance type diaphragm transducer.
b). Types of Biopotential electrodes.

- Q.5** [11]
a). Draw and explain blood pH sensor.
b). Merits and demerits of capacitive transducers.

OR

- Q.5** [11]
a). Explain microbial biosensors.
b). Describe equivalent circuit of piezoelectric transducer.

- Q.6** [12]
a). Explain electrode equivalent circuit and impedance.
b). Equivalent circuit of microelectrodes
c). Explain LVDT type diaphragm transducer.

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