

17442

15116

3 Hours / 100 Marks

Seat No.

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- Instructions* – (1) All Questions are *Compulsory*.
(2) Answer each next main Question on a new page.
(3) Illustrate your answers with neat sketches wherever necessary.
(4) Figures to the right indicate full marks.
(5) Assume suitable data, if necessary.
(6) Mobile Phone, Pager and any other Electronic Communication devices are not permissible in Examination Hall.

Marks

- 1. a) Attempt any SIX of the following:** **12**
- (i) Define biometrics. List any two biosensors.
 - (ii) State any four sources of biomedical signals.
 - (iii) Draw diagram of plethysmography and label it.
 - (iv) Define:
 - 1) Active Transducer
 - 2) Passive Transducer
 - (v) Define pH and state the formula for measurement of pH.
 - (vi) Prepare a list of any four Bio potential electrodes.
 - (vii) State any two materials used for the construction of:
 - 1) thermistor
 - 2) RTD
 - (viii) State the seeback effect.

P.T.O.

b) **Attempt any TWO of the following:**

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(i) Define:

- 1) Accuracy
- 2) Precision
- 3) Error
- 4) Repeatability

(ii) Prepare a list of types of bourdon tube and describe any one type in detail with neat sketch.

(iii) State any four basic requirements of biomedical amplifier.

2. **Attempt any FOUR of the following:**

16

- a) Draw a diagram of metal plate electrode and state its working.
- b) Draw constructional diagram of RTD and characteristics of RTD. Describe construction of RTD.
- c) Draw Man-Instrumentation system diagram. State functions of each part.
- d) Define Faraday's law of electromagnetic induction and draw electromagnetic blood flow meter and state its any two applications.
- e) Draw the constructional diagram of LVDT and state its working.
- f) With neat sketches describe pO_2 electrode.

3. Attempt any FOUR of the following: 16

- a) State any four objectives of medical instrumentation system.
- b) Draw instrumentation amplifier using 3 op amp and state the o/p equation.
- c) Draw diagram and state one use of:
 - (i) Suction electrode
 - (ii) Floating electrode
- d) Define Primary and Secondary transducer and give one example of each with the diagram.
- e) Draw piezoelectric transducer and state its working principle.
- f) Draw PCO₂ electrode and describe its working.

4. Attempt any FOUR of the following: 16

- a) Describe flow measurement by thermal convection with neat diagram.
- b) Describe bonded and unbonded strain guage. What is guage factor?
- c) Describe construction of micropipette and microelectrode,
- d) Define thermocouple and state their any four types. State any two applications of thermocouple.
- e) Classify transducer on the basis of process used, physical or chemical principle and applications.
- f) Draw pH electrode and explain its working.

- 5. Attempt any FOUR of the following:** **16**
- a) State the two types of diaphragm and describe its working. State the working of bellows.
 - b) Draw diagram of ultrasonic blood flow meter and describe its working.
 - c) State the working principle of photomultiplier tube. Draw its constructional sketch with neat label.
 - d) Draw and explain Bridge amplifier.
 - e) Define dynamic characteristics of transducers. Write any three dynamic characteristics.
 - f) State and explain any two sources of biomedical signals.
- 6. Attempt any FOUR of the following:** **16**
- a) State and explain the working of capacitive transducer with neat sketch and mathematical equation.
 - b) With the help of neat labelled diagram give constructional details of the Ga As semiconductor probe.
 - c) Describe the working of flow measurement by indicator dilution.
 - d) Draw and explain blood glucose sensor.
 - e) Define motion Artifact and state the use of Jelly.
 - f) Draw neat sketch of radiation thermometry. Write its any two advantages and two applications.
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