

17442

15162

3 Hours / 100 Marks

Seat No.

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- Instructions* – (1) All Questions are *Compulsory*.
(2) Illustrate your answers with neat sketches wherever necessary.
(3) Figures to the right indicate full marks.
(4) Assume suitable data, if necessary.
(5) 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.
 - (ii) List any four sources of biomedical signals.
 - (iii) Define flow transducer.
 - (iv) Give any two advantages of thermocouple.
 - (v) Define chemical transducer.
 - (vi) List different surface and internal types of electrodes.
 - (vii) State any two disadvantages of RTD.
 - (viii) Draw a labelled diagram of radiation thermometry.
- b) **Attempt any TWO of the following:** **8**
- (i) Classify transducers based on:
 - 1) process used
 - 2) physical or chemical principle used
 - (ii) Describe working principle of linear potentiometer.
 - (iii) Describe differentiate amplifier with neat labeled diagram.

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- 2. Attempt any FOUR of the following:** **16**
- a) Classify bioelectrodes. Give application of each electrode.
 - b) Describe constructional diagram of thermistor.
 - c) Draw and explain block diagram of biomedical instrumentation system.
 - d) Describe indicator dilution method of flow measurement.
 - e) An unbounded strain gauge has a resistance of $6\text{ k}\Omega$ and gauge factor of 3.6, what will be the change in resistance due to 3000 microstrain?
 - f) Describe PO_2 electrode with a neat labeled diagram.
- 3. Attempt any FOUR of the following:** **16**
- a) Name the source organ involved in following biomedical signals:
 - (i) EOG
 - (ii) EMG
 - (iii) ECG
 - (iv) EEG
 - b) Draw and explain instrumentation amplifier.
 - c) Draw neat labeled diagrams of fibre optic sensors.
 - d) List different properties of bioelectrodes.
 - e) What is LVDT? Describe how pressure can be measured using LVDT with a suitable diagram.
 - f) Describe electrode used to measure hydrogen ion concentration in the blood with suitable diagram.

- 4. Attempt any FOUR of the following:** **16**
- a) What is plethysmography? Describe how it is useful to record blood volume.
 - b) Describe working of piezoelectric transducer with a neat labelled diagram.
 - c) Describe electrode-electrolyte interface with neat diagram.
 - d) Draw constructional diagram of RTD. Describe characteristics of RTD with graphical representation.
 - e) Differentiate between active and passive transducer.
 - f) Describe basic structure and importance of reference electrode.
- 5. Attempt any FOUR of the following:** **16**
- a) Draw diagram of flat, corrugated, capsule and bellows type diaphragm.
 - b) Describe flow measurement by thermal convection.
 - c) Describe working principle of thermocouple.
 - d) Enlist different required characteristics of bioelectric signal amplifier.
 - e) Differentiate static and dynamic characteristics of transducer.
 - f) Explain basic objectives of an instrumentation system.
- 6. Attempt any FOUR of the following:** **16**
- a) Draw and explain types of bourdon tubes.
 - b) A platinum RTD has a resistance of 100Ω at 25°C . Find its resistance at 65°C . Resistance temperature coefficient of platinum is 0.00392 unit. Also find the temperature, if RTD has resistance of 150Ω .
 - c) Describe with neat diagram, ultrasonic flow meter.
 - d) Describe PCO_2 electrode in detail.
 - e) Compare polarizable and nonpolarizable electrodes.
 - f) List four advantages of thermistor over RTD.
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