

# 17442

**11920**

**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) Use of Non-programmable Electronic Pocket Calculator is permissible.
  - (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) List the Physiological sources of biomedical signal (any four)
  - (ii) Draw basic medical instrumentation system.
  - (iii) List flow X'ducers (any four)
  - (iv) Draw I/p and O/p characteristics of thermister.
  - (v) Draw constructional sketch for any two types of diaphragm.
  - (vi) List different types of bio-potential Electrode.
  - (vii) List basic requirements of biomedical amp<sup>f</sup>.
  - (viii) Give classification of transducer based on process used.

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- b) **Attempt any TWO of the following:** **8**
- (i) Explain performance characteristics of strainducer.
  - (ii) List different types of resistive strainducer. Give working of strain gauge, with neat diagram.
  - (iii) With neat circuit diagram give working of phase sensitive amplifier.
2. **Attempt any FOUR of the following:** **16**
- a) Classify bioelectrodes. Give application of each electrode.
  - b) Describe constructional diagram of photomultiplier tube.
  - c) List and explain different objectives of medical instrumentation system.
  - d) With neat diagram give working of flow measurement by indicator dilution method.
  - e) Draw and give functions of different Bourdon tube (four types)
  - f) Give significance of electrode skin interface and motion artifact.
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 give working of instrumentation amplifier.
  - c) Differentiate between thermistor and thermocouple (any four points).
  - d) List different internal electrodes. Draw and give working of each electrode.
  - e) What is LVDT? Describe how pressure can be measured using LVDT with a suitable diagram.
  - f) Describe electrode used to measure oxygen ion concentration in the blood with suitable diagram.

- 4. Attempt any FOUR of the following:** **16**
- a) With neat diagram give working of Ultrasonic flow transducer.
  - b) With neat diagram give working of capacitive transducer. List its applications (any two).
  - c) Describe electrode - electrolyte interface with neat diagram
  - d) Draw constructional diagram of RTD. Give metals used to manufacture RTD.
  - e) Give general constraints in design of man instrumentation system.
  - 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) What is Plethysmography? Describe how it is useful to record blood volume.
  - c) Give significance of Radiation thermometry.
  - d) Give brief classification of transducers.
  - e) Draw bridge Amplifier. Explain its working.
  - f) Define biometrics. List applications of biometrics.
- 6. Attempt any FOUR of the following:** **16**
- a) Differentiate between active and passive transducer. (any four points)
  - b) Give materials used to manufacture.
    - (i) Thermistor
    - (ii) Thermocouple
    - (iii) RTD
    - (iv) Photomultiplier tube.

- c) With neat diagram give working of ION - sensitive field-effect transistor.
  - d) Give significance and working of electromagnetic transducer.
  - e) Differentiate between polarizable and nonpolarizable electrode (any two points)
  - f) Give working of fiber-optic sensor. List out applications (any two) for the same.
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