

17442

21314

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) List any two sources of bio-medical signal.
 - ii) Write four constraints in design of medical instrumentation system.
 - iii) State the principle of thermal convection.
 - iv) Draw resistance temperature characteristics of PTC and NTC thermistor.
 - v) Draw a labelled diagram of PO₂ electrode.
 - vi) Draw a neat diagram of photomultiplier tube.
 - vii) State function of electrode gelly.
 - viii) Write working principle of thermo-couple.

P.T.O.

- b) **Attempt any TWO of the following:** **8**
- i) List of define four static characteristic of transducer.
 - ii) Draw C-type bourdon tube and describe working of it. Also state two type of bourdon tube.
 - iii) Draw diagram of instrumentation amplifier. List any four application of it.
- 2. Attempt any FOUR of the following:** **16**
- a) Describe metal micro electrode with a neat labelled diagram.
 - b) List any four advantages of optical fibre sensors.
 - c) Draw man instrumentation system and describe its working.
 - d) Describe indicator dilution method of flow measurement.
 - e) A 20mm length of wire used as a strain guage exhibits a resistance of 150Ω , when a force is applied in tension, the resistance changes by 2Ω and length changes by 0.07mm. Find guage factor GF.
 - f) Draw and state the working of pH electrode.
- 3. Attempt any FOUR of the following:** **16**
- a) List types of transducer used for following physical measurement:
 - i) Force or (Pressure)
 - ii) Displacement
 - iii) Flow
 - iv) Temperature
 - b) Draw phase sensitive amplifier. State its importance.
 - c) What are motion artifacts? How it can be reduced?

- d) Compare RTD and thermistor (any four points)
- e) Describe how displacement can be measured using LVDT with suitable diagram.
- f) Write down working of electrode used to measure partial carbon di oxide pressure in the blood with suitable diagram.

4. Attempt any FOUR of the following: 16

- a) Draw electromagnetic blood flow meter and describe its working.
- b) Describe the surface electrodes used for measurement of bio-potential with help of diagram.
- c) Draw and describe construction RTD. Also draw and describe characteristics of RTD.
- d) Draw and describe working of capacitive transducer.
- e) Distinguish between passive and active transducer. (any two points)
- f) How blood glucose can be measured? Draw its diagram and describe its working.

5. Attempt any FOUR of the following: 16

- a) Write a detail classification of transducers based on process used, principle and application.
- b) What is Plethysmography? Describe how it is useful to record blood volume with neat diagram.
- c) Define Biometrics and state objective of medical instrumentation system.
- d) Define static characteristic and dynamic characteristics. Write any two dynamic characteristics.
- e) List any eight basic requirement of bio-medical amplifier.
- f) Describe radiation thermometry with a neat labelled diagram.

6. Attempt any FOUR of the following:**16**

- a) Describe how potentiometer can be used for the measurement of linear or angular displacement with suitable diagram.
 - b) Describe electrolyte electrode interface with neat diagram.
 - c) Describe internal electrode with neat labelled diagram.
 - d) State seebeck effect. Write any two construction material for:
 - i) RTD
 - ii) Thermocouple
 - iii) Thermistor
 - e) Describe Ion sensitive field effect transistor (ISFET) with neat labelled diagram.
 - f) Describe ultrasonic flowmeter with a neat labelled diagram.
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