

17442

21415

3 Hours / 100 Marks

Seat No.

--	--	--	--	--	--	--	--

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 :

12

(a) Define Biometrics. List any two biosensors.

(b) List four constraints of Man Instrumentation system.

(c) Describe the principle of electromagnetic blood flow meter with the help of Faraday's law of electromagnetic induction.

(d) State four materials used for manufacturing of thermistor.

(e) Draw a labelled diagram of pH meter.

(f) State function of electrode jelly used to place an electrode on the patient's body.

(g) State Seebeck effect.

(h) Draw the constructional diagram of RTD.

(B) Attempt any TWO :

8

(a) Distinguish between Active and Passive transducers.

(b) Describe working of piezoelectric transducer.

(c) State the basic requirements of a bio-amplifier (any eight points).

P.T.O.

2. Attempt any FOUR :**16**

- (a) Describe electrode electrolyte interface.
- (b) With help of a neat labelled diagram give constructional details of GaAS semiconductor temperature probe.
- (c) Describe any four factors that should be considered while designing any Man Instrumentation system.
- (d) Describe flow measurement by thermal convection.
- (e) An unbounded strain gauge has a resistance of 3000Ω and gauge factor of 3.2, what will be the change in resistance due to 1500 microstrain.
- (f) Describe electrode used to measure partial oxygen pressure in the blood with a suitable diagram.

3. Attempt any FOUR :**16**

- (a) Define :
 - (i) Bio-magnetic signals
 - (ii) Bio-chemical signals
 - (iii) Bio-mechanical signals
 - (iv) Bio-acoustic signals
- (b) Draw a Differential Amplifier. State its importance.
- (c) Describe Polarizable and Non-polarizable electrodes.
- (d) List four advantages of thermistor with a neat labelled diagram.
- (e) Describe how displacement can be measured using LVDT with a suitable diagram.
- (f) Describe Blood Glucose Sensor with a neat labelled diagram.

4. Attempt any FOUR :**16**

- (a) What is Plethysmography ? Describe how it is useful to record blood volume.
- (b) Why output voltage is not zero at null displacement in characteristics of LVDT ? Justify.
- (c) Describe any two microelectrodes used for measurement of biopotential with the help of diagram.
- (d) Describe working of Radiation Thermometry with a neat diagram.
- (e) Define any four dynamic characteristics.
- (f) Describe importance of measuring electrode and reference electrode.

5. Attempt any FOUR :

16

- Draw a labelled diagram of C Shape Bourdon tube. Describe its working for pressure measurement.
- Describe working of ultrasonic flow meter.
- With help of a neat labelled diagram give constructional details of PMT and describe its working.
- Calculate the gain of the configuration shown in fig. (a). Also calculate the output voltage, if $V_a = 10 \text{ mV}$ and $V_b = 5 \text{ mV}$.

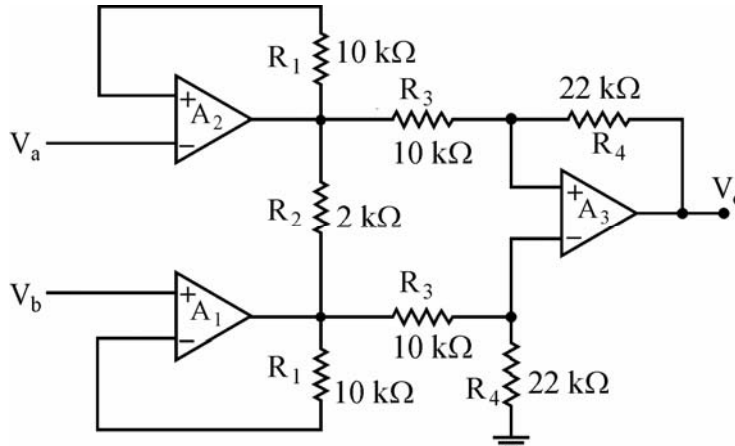


fig. (a)

- Define Accuracy, Sensitivity, Range, Linearity with respect to measurement system.
- Draw block diagram of Man Instrumentation system. State the function of any two blocks.

6. Attempt any FOUR :

16

- Describe how potentiometer can be used for the measurement of linear & angular displacement with suitable diagrams.
- Describe how Wheatstone's bridge can be used for temperature measurement with a suitable diagram.
- Describe Indicator dilution method of flow measurement.
- Describe PCO_2 electrode with a neat labelled diagram.
- What are motion artifacts ? How it can be reduced ?
- A platinum RTD has a resistance of 100Ω at 25°C .
 - Find its resistance at 50°C . The resistance temperature coefficient of platinum is $0.00392 \Omega/\Omega^\circ \text{C}$.
 - If the RTD has resistance of 120Ω , calculate the temperature.

