

17442

21819

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) Draw the schematic block diagram of man instrument system.
- (ii) Define biometrics.
- (iii) State Faraday's law of electromagnetic induction.
- (iv) List advantages of thermistor over RTD (any four).
- (v) Draw a neat labeled sketch of PO₂ electrode.
- (vi) List the four types of electrodes for measurement of bioelectric potentials.
- (vii) State the working principle of thermocouple.
- (viii) List any two materials for construction of
- 1) RTD
 - 2) Thermistor

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- b) **Attempt any TWO of the following:** **8**
- (i) List general constraints in design of man instrument system (any 8 point).
 - (ii) Describe working principle of bonded and unbounded metallic strain gauge.
 - (iii) State the basic requirements of a bioamplifier (mention eight points).
2. **Attempt any FOUR of the following:** **16**
- a) Draw micropipette electrode and describe its operation.
 - b) Describe the principle of radiation thermometry and give the expression which indicates radiation emitted by body.
 - c) Describe the four objectives of man instrumentation system.
 - d) Draw and explain the block diagram of ultrasonic blood flow meter.
 - e) An unbounded strain gauge has a resistance of 3000Ω and gauge factor of 3.6 what will be the change in resistance due to 1500 micro strain.
 - f) With a neat labelled diagram describe PO_2 electrode in detail.
3. **Attempt any FOUR of the following:** **16**
- a) Define:
 - (i) Bioelectric signals
 - (ii) Biochemical signals.Give any two example of each.
 - b) Describe working of phase sensitive detector.
 - c) What are motion artifacts? How can they be reduced?
 - d) Describe the working of photo multiples tube with neat diagram.
 - e) Draw and explain working of LVDT.
 - f) Describe blood glucose sensor with neat diagram.

- 4. Attempt any FOUR of the following: 16**
- How to determine blood flow using indicator dilution method?
 - Describe how potentiometer can be used for the measurement of linear and angular displacement.
 - Describe the electrode- electrolyte interface.
 - With the help of neat labeled sketch give constructional details of RTD.
 - List and define four dynamic characteristics of transducer.
 - Describe a reference electrode.
- 5. Attempt any FOUR of the following: 16**
- Draw and explain operation of bellows.
 - What is plethysmography? Draw its constructional diagram.
 - Explain any one type of fiber optic sensor.
 - Describe the role of differential amplifier in measurement of bioelectric signals.
 - Give classification of transducers with examples.
 - List any four specification of medical instrumentation system and explain each in brief.
- 6. Attempt any FOUR of the following: 16**
- State the working principle of piezoelectric transducer.
 - A thermistor has a resistance of 20Ω at 37°C material constant B is 4000 k draw a plot of R_t Vers temp in the range between 300 to 320 k .
 - Describe working of electromagnetic flow transducer with neat diagram.
 - Describe ISFET with a neat labeled diagram.
 - Describe needle and wire electrodes with the help of neat diagram.
 - Differentiate between thermocouple and RTD on the basis of principle, temp range application and its type.
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