

# 17442

14115

3 Hours / 100 Marks

Seat No.

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

- 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) Assume suitable data, if necessary.  
(6) Use of Non-Programmable Electronic Pocket Calculator is permissible.

**Marks**

1. (A) Attempt any SIX :

12

- (a) List any four biomedical signals.
- (b) State the objectives of medical instrumentation system.
- (c) State Faraday's laws of Electro magnetic induction.
- (d) Differentiate between NTC & PTC of temperature transducer. (give two point answer)
- (e) Draw a labelled diagram of pH electrode.
- (f) State and define polarizable and non polarizable electrode.
- (g) State the working principle of photo multiplier tube.
- (h) Draw a neat sketch of Fibre optic Sensor for temperature measurement.



P.T.O.

**(B) Attempt any TWO :****8**

- (a) List and define any two static and two dynamic characteristics of transducer.
- (b) Draw the constructional sketches of Flat, diaphragm corrugated, diaphragm capsule and bellow.
- (c) Draw and explain phase sensitive amplifier.

**2. Attempt any FOUR :****16**

- (a) Describe needle electrodes with the help of suitable diagram.
- (b) With the help of characteristic curve of thermistor, explain working of thermistor. Also state the material used for construction.
- (c) Draw MAN-instrument system and describe its blocks.
- (d) With the help of suitable diagram. Describe the working of Plethysmography.
- (e) Define active and passive transducer. Give two examples of each type.
- (f) Describe blood glucose sensor with neat diagram.

**3. Attempt any FOUR :****16**

- (a) State any four constraints in design of MIS.
- (b) Draw instrumentation amplifier with the help of three op-amp. State any four requirements of instrumentation amplifier.
- (c) Explain electrode skin interface with the help of neat diagram.
- (d) Compare thermistor and RTD with the reference of (1) Characteristics, (2) Material used (3) Range of temp. (4) Applications.
- (e) Draw and define bonded and unbonded strain gauge.
- (f) With the help of neat sketch explain PO<sub>2</sub> electrode.

**4. Attempt any FOUR :****16**

- (a) Draw Electromagnetic blood flowmeter and state its working principle.
- (b) With the help of characteristic curve and constructional diagram explain the working of LVDT.
- (c) Describe electrode electrolyte interface.
- (d) Describe the working of radiation thermometry.
- (e) Define :
  - (a) Sensitivity
  - (b) Accuracy
  - (c) Repeatability
  - (d) Reproducibility in connection to transducer
- (f) Draw a neat sketch of  $\text{PCO}_2$  electrode and describe its working.

**5. Attempt any FOUR :****16**

- (a) Draw labelled diagram of Linear and angular potentiometer. State one application of each potentiometer.
- (b) Describe flow measurement by indicator dilution.
- (c) Draw constructional diagram of thermocouple with neat label. State "See back effect". State any three types of thermocouple.
- (d) State and explain basic requirements of biomedical amplifier.
- (e) Give classification of transducers.
- (f) Define :
  - (1) Static characteristics
  - (2) Dynamic characteristics
  - (3) Biometrics
  - (4) pH

**6. Attempt any FOUR :****16**

- (a) Draw a neat sketch of C shape, spiral, helical and twisted type Bourdon tube.
  - (b) Describe optical pyrometer with neat sketch.
  - (c) Describe working of flow measurement by thermal convection.
  - (d) With the help of suitable diagram state the working of ISFET (ion-sensitive field effect transistor).
  - (e) Explain the difference between skin interface and motion artifact.
  - (f) Draw bridge amplifier using op-amp. State the equation used for balancing of bridge.
-