22348

11819

3 Hours / 70 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.*
(7) Mobile Phone, Pager and any other Electronic Communication devices are not permissible in Examination Hall.

Marks

1. Attempt **any five** of the following : **10**

a) Define transducer and give any one example of it.
b) Define motion artefacts.
c) State chemical equation for PCO_2 electrode.
d) State type of material used for making of thermistor.
e) List four types of bourdon tubes used for pressure measurement.
f) Define term pH. State range of pH value of normal arterial blood.
g) Explain with sketches the construction of :
   i) Metal electrodes
   ii) Micropipette.

2. Attempt **any three** of the following : **12**

a) Describe with sketches construction and working of linear potentiometer.
b) List advantages of optical fiber sensors.
c) Explain with sketch the flow measurement by thermal convection.
d) Explain with sketch block diagram of Man Instrumentation System (MIS).

3. Attempt **any three** of the following : **12**

a) State different units of temperature. A platinum RTD has resistance of 100 Ω at 30°C. Find its resistance at 50°C the resistance temperature coefficient of platinum is 0.00392 per degree.
b) Explain meaning of plethysmograph. Draw any instrument used to measure blood volume in human body.

Marks

c) Compare active and passive transducers.

d) Explain following transducers :

i) Capacitive transducers

ii) Piezoelectric transducers.

4. Attempt **any three** of the following : **12**

a) Explain with sketches operating principle of blood glucose sensor.

b) Classify the given transducers as a primary transducers or secondary transducers :

1) LVDT

2) Strain gauge

3) RTD

4) Bourdon tube.

c) Explain with sketches the construction of thermocouple and its principle of working.

d) Parameter or measuring technique with their measuring range has been given below. Suggest standard sensor used for measurement.

i) Blood pressure arterial direct range (10 – 100 mm) Hg

ii) PO_2 range (30 – 100 mm Hg)

iii) Blood flow range 1 – 300 ml/s

iv) Electromyograph (0.1 – 5 mv) (EMG).

5. Attempt **any two** of the following : **12**

a) With help of neat diagram give constructional details of photomultiplier tube and describe its working.

b) Explain the basic operation of :

i) Electromagnetic blood flow measurement.

ii) Ultrasonic blood flow measurement.

c) Explain concept of :

i) Carbon nanotube as biosensors

ii) Electrodes for EEG and EMG.

6. Attempt **any two** of the following : **12**

a) Explain principle of optical temperature sensor based on variation of refractive index with temperature. Give range of temperatures (hyper thermia) normally used for cancer treatment.

b) Explain term Bio MEMS. List applications of Bio MEMS.

c) For arterial pressure measurement LVDT is used. Describe bias working of LVDT along with neat sketch.

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