

**Scheme – I**

**Sample Question Paper**

**Program Name** : Diploma in Medical Electronics  
**Program Code** : MU  
**Semester** : Third  
**Course Title** : Biosensors  
**Marks** : 70

22348

**Time: 3 Hrs.**

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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) Preferably, write the answers in sequential order.

**Q.1) Attempt any FIVE of the following.**

**10 Marks**

- a) Describe any two static characteristics of instrument.
- b) Define transducer and give one example of it.
- c) List any four types of bourdon tube based on shapes.
- d) State any two applications of capacitive transducer.
- e) State Peltier effect.
- f) State chemical equation for  $pO_2$  electrode.
- g) State any two functions of electrode jelly used to place an electrode on the patient's body.

**Q.2) Attempt any THREE of the following.**

**12 Marks**

- a) Identify different sources of biomedical signals with respect to heart, brain, muscle and describe it.
- b) Explain with neat construction diagram working of angular potentiometer.
- c) Compare RTD and Thermocouple on the basis of working principle, materials used, temperature range.
- d) Draw a neat sketch of blood glucose sensor and describe its working.

**Q.3) Attempt any THREE of the following.**

**12 Marks**

- a) Explain the concept of primary transducer and secondary transducer with the help of suitable examples and diagram.
- b) Draw a neat sketch of piezoelectric transducer and explain its working principle.
- c) Draw neat sketch of radiation thermometry. Write its any two advantages and two applications.
- d) Describe thermal convection method for flow measurement with a neat sketch.

**Q.4) Attempt any THREE of the following.**

**12 Marks**

- a) Compare active and passive transducer on the basis of power requirement and give one example for each.
- b) Draw bonded and unbonded strain gauge and describe working of it.
- c) Describe working of fiber optic temperature sensor with a neat sketch.
- d) Suggest an instrument used to measure blood volume in human body. Draw its construction diagram.
- e) Draw a diagram of metal plate electrode and describe its working.

**Q.5) Attempt any TWO of the following.**

**12 Marks**

- a) An unbounded strain gauge has a resistance of  $4000 \Omega$  and gauge factor of 3.6, what will be the change in resistance due to 2000 micro strain?
- b) With help of a neat labeled diagram give constructional details of Photomultiplier tube and describe its working.
- c) Suggest an instrument used to measure blood flow in human body. Describe its construction and working along with a neat sketch

**Q.6) Attempt any TWO of the following.**

**12 Marks**

- a) State any four units of temperature.  
A platinum RTD has a resistance of  $100 \Omega$  at  $25^\circ \text{C}$ .  
i ) Find its resistance at  $65^\circ \text{C}$ . The resistance temperature coefficient of platinum is 0.00392 per degree Celsius. ii) If the RTD has a resistance of  $150 \Omega$  calculate the temperature.
- b) Explain working principle of measuring electrode and reference electrode for pH measurement with the help of neat diagrams.
- c) Define Polarizable electrodes and Non-polarizable electrodes. Draw diagrams of (i) Suction electrode (ii) Floating electrode and describe working of each.

**Scheme - I**

**Sample Test Paper - I**

**Program Name** : **Diploma in Medical Electronics**  
**Program Code** : **MU**  
**Semester** : **Third**  
**Course Title** : **Biosensors**  
**Marks** : **20**

**22348**

**Time: 1 Hour**

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**Instructions:** All questions are compulsory

1. Illustrate your answers with neat sketches wherever necessary
2. Figures to the right indicate full marks
3. Assume suitable data if necessary
4. Preferably, write the answers in sequential order

**Q.1 Attempt any FOUR.**

**08 Marks**

- a) Define transducer.
- b) State any two units of pressure.
- c) Describe any two dynamic characteristics of instrument.
- d) List any four types of bourdon tube based on shapes.
- e) Draw the block diagram of Man Instrumentation system.
- f) State any two applications of capacitive transducer.

**Q.2 Attempt any THREE.**

**12 Marks**

- a) Identify different sources of biomedical signals with respect to heart, brain, muscle and describe it.
- b) Give Types of diaphragm with neat sketch explain working principle of corrugated diaphragm. List any two applications of diaphragm.
- c) Explain how potentiometer can be used for measurement of linear and angular displacement with a suitable diagram.
- d) Define residual voltage in LVDT with the help of characteristics.
- e) Prepare a table of classification of transducers on the basis of type, physical or chemical working principle used, process used and application.
- f) Describe any four general difficulties while designing the man instrumentation system.

**Scheme - I**

**Sample Test Paper - II**

**Program Name** : Diploma in Medical Electronics  
**Program Code** : MU  
**Semester** : Third  
**Course Title** : Biosensors  
**Marks** : 20

22348

**Time: 1 Hour**

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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. Preferably, write the answers in sequential order.

**Q.1 Attempt any FOUR.**

**08 Marks**

- a) State any two materials used for the construction of thermistor.
- b) State Faradays law of electromagnetic induction
- c) State any two functions of electrode jelly used to place an electrode on the patient's body.
- d) State Peltier effect
- e) Define Polarizable electrodes
- f) Define pH and state formula for measurement of pH.

**Q.2 Attempt any THREE.**

**12Marks**

- a) Describe electrode electrolyte interface with a neat sketch.
- b) Describe construction and working of blood flow meter with a neat sketch.
- c) A platinum RTD has a resistance of 100  $\Omega$  at 25° C. Find its resistance at 65° C. The temperature coefficient of resistance for platinum is 0.00392 per degree Celsius.
- d) Draw a labeled diagram of pCO<sub>2</sub> electrode and describe its working.
- e) Describe NTC type and PTC type thermistors along with temperature and resistance characteristics.
- f) Describe Biomedical Micro Electro Mechanical Systems (Bio- MEMS).