

Name :
Roll No. :
Invigilator's Signature :

**CS/B.TECH(BME)/SEM-5/BME-502/2010-11
2010-11**

BIOMEDICAL INSTRUMENTATION

Time Allotted : 3 Hours

Full Marks : 70

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

GROUP – A

(Multiple Choice Type Questions)

1. Choose the correct alternatives for the following :

10 × 1 = 10

- i) An Isolation amplifier acts as
 - a) Bio-weapon
 - b) Energy destroyer
 - c) Energy converter
 - d) All of these.

- ii) An instrumentation amplifier is basically a kind of
 - a) Isolation amplifier
 - b) Chopper amplifier
 - c) Differential amplifier
 - d) Carrier amplifier.



iii) The skin layer that provides a natural protection against electrical danger is

- a) Endothelium
- b) Muscles
- c) Epithelium
- d) None of these.

iv) Which of the following is/are desirable static characteristic (s) ?

- a) Reproducibility
- b) Accuracy
- c) Sensitivity
- d) All of these.

v) GSR measurement is based on the activity of the

- a) Neurons
- b) Epidermal cell
- c) Sweat gland
- d) Myocardial cell.

vi) The basic role of an electrode is to convert

- a) Light signal to ionic signal
- b) Ionic signal to electrical signal
- c) Electrical signal to light signal
- d) Light signal to electrical signal.



vii) The best measure to reduce power supply to instruments is

- a) Isolation
- b) Grounding
- c) Low voltage protection
- d) Double isolation.

viii) In gross shock, the current flows through

- a) the intestine b) the lungs
- c) the heart d) limb to limb.

ix) Action potential is approximately equal to

- a) + 70 mV b) + 20 mV
- c) - 20 mV d) - 70 mV.

x) An ICU/CCU does not use

- a) Anesthesia machine b) Bedside monitor
- c) Syringe pump d) Defibrillator.



GROUP – B

(Short Answer Type Questions)

Answer any *three* of the following. $3 \times 5 = 15$

2. a) How do static characteristics of an instrument differ from its dynamic characteristics ?
b) Differentiate between "Reproducibility" and "Repeatability" ? 3 + 2
3. With a neat block diagram, focus on the significance of Biofeedback instrumentation.
4. a) Draw the equivalent circuit of a biopotential electrode.
b) Justify the use of electrode paste in biopotential measurements. 2 + 3
5. What are the factors to be considered during biomedical measurements ? Draw an electrical equivalent circuit of skin impedance. 3 + 2
6. How do microprocessors find its applications in contemporary medical instruments ?
7. a) What does "let go current level" stand for ? What is the average value of "let to current" ?
b) What is the value of perception threshold of the skin for light finger ?
c) What does ICU/CCU stand for ? (2 + 1) + 1 + 1

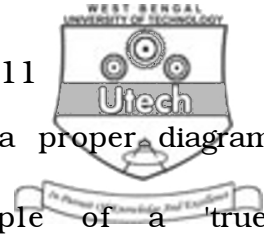


GROUP – C

(Long Answer Type Questions)

Answer any *three* of the following. $3 \times 15 = 45$

8. a) With a neat diagram briefly discuss the different components of an Isolation amplifier. Represent an Isolation amplifier symbolically.
- b) Design an Instrumentation amplifier with 3 op-amps. Hence find its gain. $(6 + 2) + 7$
9. a) What is the key difference between GSR and BSR ? What is the medical significance of GSR measurement ? Describe the procedure of GSR measurement.
- b) Is there any difference between skin impedance and skin-contact impedance ? Justify your answer. What is the range of normal skin impedance ? $(1 + 2 + 7) + (4 + 1)$
10. a) Define the following terms :
- i) Cardiac output
- ii) Stroke volume.



- b) What is Plethysmography ? With a proper diagram discuss the operating principle of a 'true' plethysmograph. (2 + 2) + (2 + 9)

11. a) Differentiate between macro-shock and micro-shock.
Draw a generalized model of an electrical accident.

- b) Discuss the physiological effects of electrical current in human body. (3 + 3) + 9

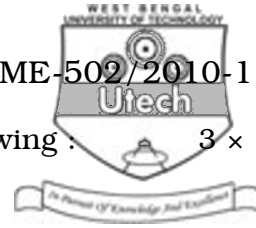
12. a) Discuss the significance of the 'Einthoven Triangle' in ECG measurement.

- b) Name the different leads used in ECG measurements.

- c) Explain the method of blood pressure measurement by using Korotkoff's method.

- d) Explain the differences between neutral and ground.

5 + 2 + 5 + 3



13. Write short notes on any *three* of the following : 3 × 5

- a) Man-Instrument system
 - b) Biofeedback instrumentation
 - c) Chopper amplifier
 - d) Phase sensitive detector (PSD)
 - e) Shock hazards from electrical equipment
 - f) Classification of errors in measurement
 - g) Data acquisition system.
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