

Invigilator's Signature :

CS/B.Tech(BME)/SEM-5/BME-502/2011-12 2011

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 :

 $10 \times 1 = 10$

- i) The degree to which variations in the output of an instrument follow input variations is referred to as
 - a) Sensitivity b) Linearity
 - c) Hysteresis d) Accuracy.

ii) Which of the following should be as high as possible ?

- a) Signal to Noise ratio b) Hysteresis
- c) Range d) Frequency response.

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iii) Buffer amplifier has a gain of

- a) 0.5 b)
- c) 0 d) none of these.

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- iv) Most indirect methods of blood pressure measure
 - are based on
 - a) Dalton's pressure law
 - b) Riva Rocci principle
 - c) Ultrasonic principle
 - d) Rheographic principle.
- v) Plethysmography is a process to measure the
 - a) all body activity b) neural activity
 - c) respiratory output d) cardiac output.
- vi) Which are the two limbs connected to leads in LEAD I bipolar standard lead system ?
 - a) Left arm left leg b) Right arm right leg
 - c) Right arm left leg d) none of these.
- vii) The phonocardiograph is used for recording the sounds connected to which of the following ?
 - a) Pumping action of heart
 - b) Movement of valves
 - c) Pulsations in blood vessels
 - d) None of these.
- viii) Bioamplifiers should have
 - a) high output impedance
 - b) low input impedance
 - c) low output impedance
 - d) none of these.

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GROUP – B

(Short Answer Type Questions)

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

- 2. What is the man/subject-instrument system ? What are the main parts/components of this system ? 2 + 3
- 3. Briefly discuss the bipolar and tetrapolar methods for impedance measurements.
- 4. What are physiological effects of electric current ?
- 5. What are static and dynamic characteristics of instrument ? Classify instrumental errors for biomedical measurement.

3 + 2

- 6. How electrostatic and electromagnetic signals become a source of noise to biosignals ? Briefly explain how it can be eliminated.
- 7. Explain Corotkoff method of indirect blood pressure measurement.

GROUP – C

(Long Answer Type Questions)

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

8. What is a patient monitoring system ? Explain with neat block diagram. What parameters does it measure ?

3 + 9 + 3

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- 9. a) Briefly describe a procedure for the measurement of impedance pneumography. 8
 - b) What are the preventive measure to reduce the electric shock hazards ? 7
- 10. What is Cardiac Output (CO)? Briefly describe a standard procedure for Cardiac Output (CO) measurement with suitable mathematical equation. What is recirculation artifact in this measurement? How can you reduce this recirculation artifact? 3+9+1+2
- 11. a) Describe the 12-lead ECG system with reference to the Einthoven triangle. 8
 - b) Draw the block diagram of the ECG machine explaining the function of each block. 7
- 12. a) Explain the impedance-frequency characteristics of living tissue with a neat diagram. How does the endocrine activity modify the body impedance characteristics ? 5
 - b) What is the principle behind blood volume measurement by Impedance method ? Derive an equation for the variation of blood volume in a vessel with the change in its basal resistance. 6
 - c) Describe the method of Thoracic Impedance Cardiography. 4

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

- a) Carrier amplifier
- b) Holter Monitor
- c) Cardiac Stress Test
- d) Isolation amplifier
- e) Application of microprocessor in biomedical measurement.

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