

Code: 9A10802

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B.Tech IV Year II Semester (R09) Regular Examinations, March/April 2013

**BIOMEDICAL INSTRUMENTATION**

(Common to E.Con.E &amp; EIE)

Time: 3 hours

Max. Marks: 70

Answer any FIVE questions.  
All questions carry equal marks.

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- 1 (a) Draw the block diagram of biomedical instrumentation system. Explain.  
(b) What is a biomedical signal? List the various bio-medical signals.
- 2 (a) Explain about Nernst equation for bio-electric potentials.  
(b) Define the terms:
  - (i) Resting potential.
  - (ii) Action potential.
  - (iii) Depolarization & Repolarisation with reference to human cell.
- 3 Draw & explain equivalent circuit of a micro electrode.
- 4 Write briefly about cardiac cycle with neat sketch.
- 5 (a) Explain fibrillation. How do you correct the fibrillation?  
(b) Explain D.C defibrillator.
- 6 (a) Explain how can electromyography measurements be made.  
(b) What is evoked potential response? Explain.
- 7 Draw a block diagram of a servo controlled ventilator along with its accessories & explain its function.
- 8 What are typical hazard situations in hospitals and what are the ways of avoiding them?

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- 1 (a) What are the desirable characteristics of bio-medical instrumentation systems? Explain.  
(b) What are the difficulties in measuring living system? Explain in detail.
- 2 (a) Discuss the different ways of transport of ions through the cell membrane.  
(b) Describe conduction through nerve to neuro-muscular junction.
- 3 Explain: (i) Suction electrodes (ii) Floating electrodes.
- 4 (a) Sketch the cardiograms taken from (i) A normal person (ii) A patient with heat tremours  
(iii) A defective machine.  
(b) What are the various errors associated with electrodes in measurement of body potential? Explain.
- 5 What is Einthoven triangle? Explain different types of ECG lead configuration with necessary sketches.
- 6 Draw the block diagram of an EEG unit and explain the different parts in it.
- 7 (a) Explain the working of spirometer with the help of function diagram.  
(b) Describe a method to determine the concentration of oxygen in expired air.
- 8 Describe the possibilities of occurrence of electrical accidents for patients in a hospital.

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- 1 (a) What are the design factors of biomedical instrumentation? Explain.  
(b) What are the analogy between engineering system and human systems?
- 2 (a) Explain the characteristics of resting potential with reference to Nernst equation.  
(b) Discuss the development of action potential and muscular contraction.
- 3 What are bioelectrodes? Enumerate their essential characteristics for biomedical applications.
- 4 With neat sketch explain the relation between electrical & mechanical activities of the heart.
- 5 Explain with neat sketch working of a dialysis machine.
- 6 Describe 10-20 electrode system used in EEG.
- 7 Describe how to measure respiratory rate using,  
(i)  $CO_2$  method of respiratory rate measurement.  
(ii) Impedance pneumotachograph.
- 8 What are microshocks and macroshocks? Explain with neat sketches.

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- 1 (a) What are the classifications of bio-medical instrumentation systems?  
(b) Classify the biomedical instrumentation.
- 2 Explain the structure of human cell and its constituents with the help of neat diagram.
- 3 With sketches, describe the surface and needle electrodes used in biomedical applications.
- 4 (a) Name the three basic types of electrodes for measurement of bioelectric potentials. Explain the surface electrodes in detail.  
(b) What do you understand by the term "reference electrode"?
- 5 (a) What is a pacemaker? Explain demand pacemaker in detail.  
(b) Discuss about short wave diathermy.
- 6 (a) Define latency. Measure the conduction velocity in peripheral nerves.  
(b) Describe the recording set up used in EMG.
- 7 Describe a method to determine the total lung capacity.
- 8 (a) Describe the various sources of electrical hazards faced with bio-medical equipment.  
(b) Explain ground fault interrupt with neat sketch.

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