B/12/2013 M

ETC 8 – (E-IV) 2 (RC)

B.E. (ETC) (RC) (Semester – VIII) Examination, Nov./Dec. 2013
BIOMEDICAL ELECTRONICS AND INSTRUMENTATION (Elective – IV)

Duration : 3 Hours Total Marks : 100

Instructions : *1) Answer **any five** questions.*
*2) Attempt minimum of **one** question from **each** Module.*
*3) **Assume** suitable data, **if necessary**.*
*4) **All** symbols and abbreviations carry their **usual** meaning.*
*5) Figures to the **right** indicate marks.*

MODULE – I

1. a) What is a 'Nernst Equation' ? Compare the following ECG Electrodes with diagrams :
Suction electrodes and Disposable electrodes. **(6+6+8)**

   b) Explain with a diagram how is the pH measurement done.

   c) Compare the cell potential of the heart and the nerve cell potential (action and resting potentials). Explain the electrical activity associated with one contraction in a muscle.

2. a) Draw the block diagram and explain the Pulsed Doppler Flow meter used to measure blood flow. **(8+4+8)**

   b) Compare the waveform and frequency ranges for the following bioelectric signals
      i) Electrocardiogram (ECG)
      ii) Electroencephalogram (EEG)

   c) With the help of the constructional details of the pCO2 electrode, explain the Blood pCO2 measurement.

3. a) List some of the precautions to minimize Electric Shock Hazards for medical equipments. **(3+10+7)**

   b) Draw and explain the block diagram of the Bedside Patient Monitor to assess continuously important physiological variable of patients during critical periods particularly the following variables (to be obtained before feeding to the bed side monitor : i) *Heart Rate* ii) ECG using Bipolar lead connections.

   c) What are the disadvantages of direct method of monitoring blood pressure ? How would you overcome this method ? Suggest a suitable method and explain with the help of a block diagram.

P.T.O.

4. a) What are the effects of various Artefacts on the ECG recordings ? (4+6+10)

   b) What are 'Korotkoff sounds' ? With the help of a graph, explain the principle of blood pressure measurement based on these sounds.

   c) Draw and explain a block diagram for a ECG machine which uses a microprocessor to capture the heart signals from a standard 12-lead configuration.

5. a) In context of cardiac Defibrillatory answer the following questions : (10+10)

      i) What is ventricular fibrillation ?

      ii) Draw the block diagram of a Defibrillator monitor.

   b) What are implantable pacemakers ? Draw and explain the Ventricular synchronous demand Pacemaker. What are the performance aspects of Implantable pacemakers ?

6. a) Briefly explain the following : (5×3=15)

      i) Block diagram of the Audiometer system

      ii) Similarities between Physiotherapy and Cryotherapy

      iii) Differences between TDM and FDM radiometry.

   b) Draw and explain the basic circuit of a dc defibrillator. What is the applicaiton of such a circuit ? Draw a typical discharge pulse of a dc defibrillator. 5

7. Answer the following in detail. **any two** : (10+10)

   a) Compare the block diagrams and the working of the medical imaging equipments such as CT scan and MRI scan. What are their merits and demerits.

   b) What are the different types of Ultrasonic Imaging : compare their advantages and applications with examples.

   c) Explain any one Robotic applicaiton with features and its block diagram which is used in surgical and highly critical medical field.

8. Answer the following : (10+10)

   a) The instrumentation and functioning of Endoscopy.

   b) *Compare Single Positron Emission Computed Tomography (SPECT) and Positron Emission Tomography (PET).*