

Sl. No. – 6213

F-5

Unique Paper Code: 2511507

Name of the Paper: Biomedical Instrumentation-I

Name of the Course: B.Tech Instrumentation

Semester: V

Duration: 3 Hours

Maximum Marks: 75 Marks

Attempt five questions in all. Non-programmable Scientific calculator is allowed.

Question No. 1 is compulsory.
All questions carry equal marks.

- Q.1
- (a) Why the cell in a nerve does excite the succeeding cell and not the preceding one? (3)
 - (b) What is the limitation of using dc amplifiers? What is the significance of isolation amplifiers in biomedical recorders such as ECG, EEG and EMG? (3)
 - (c) Distinguish between diagnostic and therapeutic biomedical instrument. Why is DC excitation not used for electromagnetic blood flow meters? (3)
 - (d) What are the advantages of a rotating anode X ray tube over stationary anode tube? List the materials used for making the anode for X ray tube with their characteristics. (3)
 - (e) Distinguish between obstructive and restrictive lung disease. How are the two identified using spirometer? (3)
- Q.2
- (a) Explain with the help of diagram, principle of bell jar spirometer. How can the measurement process using this spirometer be automated? (5)
 - (b) List the different types of pacemakers available? What is the principal advantage of AV synchronized pacemaker? Explain its working. (5)
 - (c) How is a human model simulated to obtain reference for IR imaging? List the applications of thermography (5)
- Q.3
- (a) Illustrate the principle and working of ultrasonic Doppler shift flow velocity meter with the help of a diagram. (5)

- (b) Is the biopotential electrode a sensor or a transducer? Draw and explain the equivalent circuit of a biopotential electrode interface. (5)
- (c) Describe the ECG waveform depicting its features. How do these features help the physician in knowing the condition of heart? Calculate the heart rate in bpm of a patient with R to R interval of 856 ms. (5)
- Q.4 (a) Describe the major sections of a typical EEG machine and explain the flow of signals with the help of a diagram. (5)
- (b) How is EEG signal classified in terms of frequency? What are evoked potentials and how are these potentials separated from EEG signal. (5)
- (c) Explain different types of visualising techniques used in X ray machine. (5)
- Q.5 (a) What is impedance pneumography? Explain the principle of its measurement. Why is this technique not suitable for measuring lung volume, even if it is properly calibrated? (5)
- (b) With the help of a circuit diagram, explain the operation of an instrument used to correct fibrillation of heart muscles. (5)
- (c) What is a medical ventilator? Explain its principle of operation. (5)
- Q.6 (a) What is the principle of measurement of pulse oximeter. What are its advantages over other oximeters. (5)
- (b) What are the requirements of a good physiological transducer? Explain the operation of any two types of physiological transducers along with relevant sketches. (5)
- (c) Explain the auscultatory method of blood pressure measurement. Give suggestions to make this measurement technique automatic. (5)
- Q.7 (a) A person has a total lung capacity of 5.95 litres. If the volume of air left in the lungs at the end of maximal expiration is 1.19 litres, what is his vital capacity? (3)
- (b) How is a lead of ECG different from an electrode of ECG? Explain the 12 lead standard ECG recording systems. (6)
- (c) With the help of a diagram, explain how X rays are generated in the X-Ray machine. (6)