Total No. of printed pages = 6

CAI-601/BI/6th Sem/2017/N

BIOMEDICAL INSTRUMENTATION

Full Marks – 70

Time – Three hours

The figures in the margin indicate full marks for the questions.

The question paper consists of two parts : Part-A and Part-B. Both are compulsory.

PART – A

Marks – 25

All questions are compulsory.

1. Answer the following questions : 10

   (i) What is the frequency band of theta rhythms in EEG ?

   (ii) What is meant by central nervous system ?

   (iii) What is synapse ?

   (iv) Differentiate between active and passive transducer.

(v) Define Korotkoff sound.

(vi) What is the main advantage of using differential amplifier in biomedical equipment ?

(vii) Define skin-surface temperature.

(viii) State all or nothing law.

(ix) Define evoked potential.

(x) What are the requirements of amplifiers used in biomedical recorders ?

2. State whether the following statements are true or false. If false, write the correct one. 5

(i) The human skeleton serves as a reservoir for calcium, phosphorous.

(ii) Example of voluntary or skeletal muscle is cardiac muscles.

(iii) An average adult is said to consist of about 100 billion of cells.

(iv) Cartilage is a firm tissue, but is softer and much flexible than bones.

(v) Motor neurons receive a stimulus and transmit it to a control station for analysis.

3. Fill in the blanks : 5

(i) The upper limit of blood pressure is known as _____.

(ii) The frequency range of ECG wave is _____.

(iii) The node where pacemaker cells are there known as _____.

(iv) Principle of operation of plethysmograph depends on _____ law.

(v) Electromagnetic blood flow meter is based on the principle of _____ induction.

4. Match column A with the correct answer from column B. 5

Column-A (Transducer type)	Column-B (Applications)
(a) LVDT	(i) Oral temperature
(b) Thermistor	(ii) Blood flow
(c) LDR	(iii) Muscle contraction
(d) Electromagnetic	(iv) Photo-plethysmography
(e) Piezoelectric	(v) Grip force

PART – B

Marks – 45

Answer any *five* questions.

5. (a) List the general characteristics of human cell. 6

(b) Differentiate between Isotonic and Isometric contraction of muscles. 3

6. (a) What do you understand by the terms "Polarized and Depolarized cells" ? 4

(b) What is the difference between "absolute refractory period" and "relative refractory period" ? 3

(c) State the function of "bundle of His" in heart. 2

7. (a) Draw the waveform of arterial blood pressure as a function of time. Label the dicrotic notch in the waveform and explain the reason of its appearance. 4

(b) Draw an action potential waveform and label the amplitude and time values. 5

8. (a) What do you understand by the term 'Mean arterial pressure' ? 3

(b) Define the processes Diffusion, Active transport and Pinocytosis of cell. 6

9 (a) Discuss 'Electroratinography' and 'Electro-oculography' with their characteristics. 5

(b) Draw a simplified block diagram of the cardiovascular circulatory system from engineering viewpoint. 4

10. (a) Why are microelectrodes sometimes needed ? What are the advantages of metal microelectrode over the micropipet electrode ? 4

(b) Mention the common problem faced with the use of plate, suction cup and immersion electrodes for capturing bio potentials. 3

(c) Why the 10-20 EEG electrode placement system used in clinical practice and is named so ? 2

11. (a) Explain how LVDT can be used in biomedical instrumentation. 4

(b) What is the function of collimator and grids in X-ray imaging ? 3

(c) What are microshock and macroshock ? 2

12. (a) What are the techniques available for the measurement of heart rate ? 2

(b) List the different classifications of bio-medical instruments with suitable examples. 3

(c) State the working of DC defibrillator. 4