Total No. of printed pages = 5

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

BIOMEDICAL INSTRUMENTATION

Full Marks – 70

Pass Marks – 28

Time – Three hours

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

Answer any *seven* questions.

1. (a) Fill in the blanks : 5

(i) The skeleton of human body serves as a reservoir of _____ and _____.

(ii) An average adult is said to consist of about _____ number of cells.

(iii) The cells of the tissue are held together by _____, a product formed by the cells themselves.

(iv) The semipermeable membrane of human cell has a thickness of _____ units.

[Turn over

(b) Match the items on the right to the items as on the left. 5

Column-A	Column-B
Cardiovascular	Pneumatic system
Respiratory	Stimulus
REM sleep	Hydraulic system
Irratibility	ECG
Immersion electrode	EEG

2. (a) State whether the following statements are true or false. If it is 'false', state the correct one. 5

(i) Half of the human body is water, of this half, three-fourth of the water is in the cells.

(ii) The under arm body temperature is 1^{o} higher than oral reading.

(iii) Action potentials for heart muscles usually lasts from 150-300 m sec.

(iv) Two or more tissues of dissimilar physiology combined together in a particular pattern to form organs.

(v) The ventricular muscles are much larger and more important than the muscles of atria.

(b) Name the different kinds of muscles found in the muscular system of human with suitable examples. 5

3. (a) What are the two different types of temperature measurements that can be obtained from the human body ? Also explain, how temperature is controlled in the body by brain. 6

(b) How are the potentials in the muscle fiber measured and what is the record called that is obtained therefrom ? 2

(c) What is meant by mean arterial pressure ? How do you measure it ? 2

4. (a) Why electrolyte paste/jelly is used with floating electrode ? 2

(b) Draw an waveshape of blood pressure on a time base and explain it. What is the dicrotic notch ? 6

(c) What part of cardiovascular system contains the greatest volume of blood ? 1

(d) For a patient, which type of electrode will cause least injury ? 1

5. (a) Draw an electrocardiogram, labelling critical features. Include typical amplitudes and time intervals for a normal adult. 6

(b) What is an ear-clip electrode used for ? 1

(c) Discuss some possible uses of electro-myography. 3

6. (a) Explain the operation of a pacemaker. Why it is needed ? 6

(b) Draw a sketch of a neuron and label the cell body, dendrite, axon and axon hillock. 4

7. (a) Describe the principle of visualizing body organs by X-rays. 6

(b) What are the nodes of Ranvier and what useful purpose do they serve ? 2

(c) What is a 10-20 electrode placement system and with what bioelectric instrument is it used ? 2

8. (a) What do you understand by fibrillation ? How do you correct it ? Draw a circuit for DC current defribillator. 7

(b) Why are the vector sum of the projections on the frontal plane cardiac vector at any instant onto the three axes of the Einthoven triangle is zero ? 3

9. (a) Explain the difference between a motor nerve and a sensory nerve. 2

(b) In a harmonic analysis of the following waveforms, what range of frequency and potential could be expected in human body ?

(i) The ECG

(ii) The EEG

(iii) The EMG 6

(c) What is meant by "Plethysmography" ? 2