Total No. of printed pages = 7

END SEMESTER EXAMINATION – 2019

Semester : 6th

Subject Code : CAI-601

BIOMEDICAL INSTRUMENTATION

Full Marks –70

Time – Three hours

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

PART – A

Marks – 25

All questions are compulsory.

1. Choose the correct answer : 5

(i) The average quantity of blood in a man's body is about 5 litres and is circulated completely in

(a) 1 minute (b) 10 minutes

(c) 60 minutes (d) None of these

[Turn over

(ii) Blood glucose level measurement device uses a biosensor works on the principle of

(a) Mechanical (b) Chemical

(c) Biological (d) Electrochemical

(iii) Normal diastolic blood pressure ranges from 60 to 90 mm of Hg and its average value is

(a) 30 mm of Hg (b) 60 mm of Hg

(c) 120 mm of Hg (d) 180 mm of Hg

(iv) The input fibres of the neuron are called

(a) Axon (b) Dendrite

(c) Motor (d) Stenosis

(v) From engineering viewpoint, the pump constituting the left heart may be considered as

(a) Volume pump

(b) Pressure pump

(c) Both (a) and (b) above

(d) None of these

2. Fill in the blanks :

(i) In abnormal hearts, an additional sound is heard and known as _____.

(ii) The colour code for the lead connected to left leg in ECG is _____.

(iii) _____ is used to counteract fibrillation by application of electric impulses to the heart.

(iv) For recording ECG, _____ numbers of unipolar chest leads are used.

(v) The heart pumps at an average rate of _____ beats per minute.

(vi) The fat like substance forming a sheath around nerve fibres are _____.

(vii) The graphic recording of heart sound is known as _____.

(viii) _____ is the recording of the bio-potentials generated by the movement of eye ball.

(ix) Between the beats, the heart mechanically rests and this is called the period of _____.

(x) Several organs whose functions are inter-related constitute a _____.

3. Fill in the blanks : 10

(i) The body's "hydraulic" system, or cardio-vascular system, has a two chamber heart pump and it is connected to flexible blood vessel tubing.

(ii) Na+, K+ and Cl – are principal ions that are involved with the phenomena of producing cell potentials.

(iii) Cells depolarize and action potential is generated as soon as a stimulus is applied.

(iv) EKG stands for electroretinography.

(v) In floating electrodes metal electrode does not make direct contact with the skin.

(vi) SA Node is considered to be the primary pacemaker of the heart.

(vii) Active transducers work on the principle of energy conversion.

(viii) Dicrotic notch on the blood pressure waveform appears due to the closure of aortic valve by the back pressure of blood.

(ix) The ability of the sensor to see small differences in reading is called resolution.

(x) The term spectrum is used when referring to the frequency content of a signal.

Part – B

Marks – 45

Answer any *five* questions.

4. (a) What are the factors that has to be considered in the design of medical instrumentation system ?

(b) State the basic objectives of man instrumentation system. 4

5. (a) What is a bio potential ? 2

(b) Define the following terms :

(i) Sodium pump

(ii) All or nothing law 3

(c) Differentiate between :

(i) Systemic and pulmonary circulation

(ii) Tachycardia and bradycardia 4

6. (a) Explain the events of ECG waveform related to the action potential propagation pattern in the heart. 5

(b) What do you understand by evoked EEG measurement ? 2

(c) What are the difficulties faced with the use of immersion electrode which was the earlier version of body surface electrode ? 2

7. (a) When the use of needle electrode is preferred ? 1

(b) With the help of plots show the relationship of the appearance of heart sound with the events of ECG waveform. 4

(c) What are the causes of the two heart sounds ? Why do the murmurs appear with the two heart sounds ? 4

8. (a) Arrange the following vessels in decreasing order of blood pressure inside them :

Venacava, aorta, venules, capillaries. 4

(b) Explain the process of measuring systolic and diastolic blood pressure with sphygmo-manometer. 5

9. (a) Why the 10-20 EEG electrode placement system used in clinical practice is named so ? 1

(b) Explain polarization, depolarization and re-polarization with diagrams. 8

10. (a) What is a neuron ? Define the various parameters associated with it. 5

(b) Explain the working of DC defibrillator. 4

11. (a) Draw an electrocardiogram in lead-II configuration.

(b) Explain the difference between indirect and direct measurement of blood pressure. 3

(c) Name the desirable characteristics of a bio-amplifier. 3