Total No. of printed pages = 7

END SEMESTER EXAMINATION – 2020

Subject Code : CAI-601

BIOMEDICAL INSTRUMENTATION

Full Marks – 70

Time – Three hours

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

Instructions :

1. *All* questions of PART–A are compulsory.
2. Answer any *five* questions from PART–B.

PART – A

Marks – 25

1. Choose the correct answer : 1×5=5

   (i) During ECG measurement, an electro cardiologist can utilize any one out of

   (a) 12 lead selections

   (b) 10 lead selections

   (c) 5 lead selections

   (d) None of these

[Turn over

(ii) Murmurs are generally caused by

(a) regurgitation

(b) improper opening of valves

(c) Both (a) & (b)

(d) None of (a) & (b)

(iii) Blood enters the heart on right side through

(a) superior vena cava

(b) inferior vena cava

(c) Both (a) & (b)

(d) None of (a) & (b)

(iv) The electrode which can minimize motion artifact is

(a) Metal plate electrode

(b) Suction cup electrode

(c) Floating electrode

(d) All of these

(v) Microelectrodes, because of small surface area have impedances upto

(a) Milli-ohm (b) Kilo-ohm

(c) Mega-ohm (d) None of these

2. State whether the following statements are true or false. If false, write the correct one : $1 \times 10 = 10$

(i) The underarm temperature is about 1^0F lower than oral temperature.

(ii) The duodenal gland produces hydrochloride acid using its hormones.

(iii) The excretion of the most of volatile substances from our body occurs through the lungs.

(iv) Friction in the joints of skeleton is reduced by a smooth articular cartilage and capsule containing viscous fluid.

(v) Blood flows into the heart from veins which collects waste products resulting from cell metabolism.

(vi) The nasal cavity contains some hair and is also wet at the back to filter dirt particles from air.

(vii) An in vitro measurement is one performed inside the body.

(viii) Signal conditioning equipment can't combine or relate the outputs of two transducers.

(ix) In the ECG waveform, P-wave represents repolarization of ventricular muscles.

(x) Another form of ECG measurement is "evoked response".

3. Fill in the blanks : 1×10=10

(i) EEG frequency band above 13Hz is known as _____.

(ii) The bioelectric potentials associated with muscle activity constitute the _____.

(iii) The action potential for heart muscle usually lasts from _____ to _____ msec.

(iv) _____ is an active process that transports the Na^+ ions quickly to outside the cell.

(v) Each action potential in the heart originates from the point of top right atrium called _____.

(vi) _____ electrodes are used to penetrate the skin to record EEG potentials.

(vii) The right heart may be considered as _____ pump.

(viii) The second heart sound is usually _____ in pitch than the first heart sound.

(ix) A slower heart rate is called _____.

(x) The colour code of right leg used in ECG measurement is _____.

PART – B

Marks – 45

4. (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

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 term 'Mean arterial pressure' ? 3

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

7. (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

8. (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) What are resting and action potentials ? Draw an action potential waveform and label the amplitude and time values. 5

9. (a) Draw an electrocardiogram in lead-II configuration. 3

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

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

10. (a) Explain the setup of photodetectors for detecting the pulsatile blood volume changes. 5

(b) Explain schematically the working of an x-ray generator. 4

11. Write short notes on any *three* of the following : 3×3=9

(a) Einthoven's triangle

(b) Microelectrode

(c) Gauge factor

(d) Central nervous system.