B.Sc. 5th Semester (Honours) Examination, 2023 (CBCS)

Subject : Physics

Course : DSE-1 (OR)

(Medical Physics)

Time: 2 Hours   **Full Marks: 40**

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

1. Answer *any five* questions: 2×5=10

   (a) What is electromyography (EMG)?

   (b) Find out the degrees of freedom in case of upper human limb.

   (c) Give examples of axial and appendicular skeletons in human body.

   (d) What is external beam radiotherapy (EBRT)?

   (e) Calculate the mean arterial pressure (MAP) of a person, while the output of BP measurement is 120/80.

   (f) What do you mean by 'visual field loss' in case of glaucoma?

   (g) Determine the action time and resting time of heart muscle when the heart rate is 90 pulses/min.

   (h) What is loudness? Write down the physical quantities behind the perception "loudness".

2. Answer *any two* questions: 5×2=10

   (a) Describe the basic principle of Electrocardiography (ECG)? Hence define P, Q, R, S and T (with proper schematic diagram) in case of a typical normal signal recorded between two electrodes.   1+4

   (b) What are the main components of Central Nervous System (CNS)? Draw the electrical circuit analogus to a small axon and find out the energy required to recharge 500 mm length of non-myelinated axon, where $C = 3 \times 10^{-7}$ F/m.   1+4

   (c) Write down short notes on *any two*:   2½×2=5

   (i) Nuclear Medicine

   (ii) Dosimeter

   (iii) Computed Tomography Scan

   (d) Define intraocular pressure in case of a human eye. Calculate the force at intraocular region of a human being suffering from glaucoma (eye pressure 85 mm Hg), where the back area of her/his eye is 6 cm². 1+4

3. Answer *any two* questions: 10×2=20

(a) Define anatomic plane in human body. Briefly describe the major anatomical planes. State the four levels of integration in the neuromusculo-skeletal system. Hence, describe human elbow as a class-3 lever. 1+2+3+4

(b) What is total peripheral resistance (TPR) to flow (blood flow in case of human body) and cardiac output (CO)? Calculate the cardiac output when TPR is 600 and BP is 80/60. Hence find the clinical significance of this result. 3+4+3

(c) Describe the basic principle of an ionisation chamber. If, α-particles (energy of which is 9MeV) looses their energy completely while passing through an ionisation chamber, then calculate the output voltage. What is characteristic X-ray spectrum? The potential difference applied to an X-ray tube is 5 kV and the current through it is 3.2 mA. Find the number of electrons striking the target (at every second). 2+4+1+3

(d) What is basal metabolic rate? Find the metabolic rate (at rest) of a 70 kg human being (height-1.55 m), while the energy consumption is 40 cal/m^2-hr. The sound intensity of a sound source is $7 \times 10^{-6} w/m^2$. If the loudness of sound is decreased by 10 dB, determine the intensity of sound. 2+5+3

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