BIOMEDICAL INSTRUMENTATION
(AEIE 3241)

Time Allotted : 3 hrs   **Full Marks : 70**

Figures out of the right margin indicate full marks.

Candidates are required to answer Group A and
__any 5 (five)__ from Group B to E, taking __at least one__ from each group.

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

Group – A
(Multiple Choice Type Questions)

1. Choose the correct alternative for the following: **10 × 1 = 10**

   (i)   In thermodilution the indicator used is
          (a) Cold Water   (b) Hot Water
          (c) any of (a) or (b)   (d) both (a) and (b)

   (ii)   Bundle of HIS transmits electrical signal to
          (a) SA Node   (b) AV Node
          (c) Ventricle wall   (d) Delay line

   (iii) In Defibrillators the electrodes used are
          (a) polarizable   (b) nonpolarisable
          (c) none of these   (d) both (a) and (b).

   (iv)   Total no precordial chest lead are
          (a) 12   (b) 5
          (c) 6   (d) 3

   (v)   The pH level of human blood is typically
          (a) 7   (b) 6.8
          (c) 7.4   (d) None of these

   (vi)   Value of let-go current in man
          (a) 5mA   (b) 9mA
          (c) 16mA   (d) 21mA

   (vii) Valve situated at the junction of right atrium and ventricle is called
          (a) Tricuspid   (b) Bicuspid
          (c) Pulmonary   (d) Aortic

   (viii) From Einthoven triangle we have-
          (a) $V_I = V_{II} + V_{III}$ (b) $V_{III} = V_{II} + V_I$
          (c) $V_{II} = V_I + V_{III}$ (d) None of these.

    (ix)   The delay line is situated
          (a) below the SA node   (b) under the AV node
          (c) ventricular muscles   (d) Septum

    (x)   Oxygenated blood is sent to heart muscle cell through
          (a) Aorta   (b) Superior and Inferior vena cava
          (c) Pulmonary artery   (d) Coronary Artery.

Group – B

2.   (a)   Describe various skin surface electrodes with diagram. What do you mean by polarisable and Non-polarisable electrode? Between the above mentioned, which type electrode is used in Bio potential measurement from body surface and why?

        (b)   Differentiate between:
           (i) Gross anatomy and Topographical anatomy.
           (ii) Action Potential and resting potential.

           (4 + 2 + 1 + 1) + (2 × 2) = 12

3.   (a)   Write the significance of pH, pCO_2 and pO_2 measurement. Explain the working of a pCO_2.

        (b)   With neat diagram write short notes on electrical signal generation and conduction through heart muscle cells.

           (3 + 5) + 4 = 12

Group – C

4.   Explain the working principle of Thermistor. Describe how it is used to measure Cardiac Output (CO)? Also add the disadvantage of the process. Describe the most convenient way of CO measurement with its advantages.

           (2 + 4 + 2 + 4) = 12

5.   What are the drawbacks found in electromagnetic blood flow meter compare to industrial electromagnetic flow meter? What is transformer voltage? How it is eliminated from flow voltage? Describe one of the convenient method.

           (3 + 1 + 2 + 6) = 12

Group – D

6.   (a)   Explain the Bipolar limb leads from Einthoven's triangle. Draw the connection. How many unipolar leads are there in ECG lead system?

        (b)   Explain the basic operation of Defibrillator. Also write about the electrodes.

           (3 + 3 + 1) + (3 + 2) = 12

7. Describe the lead wire and electrodes of artificial pacemaker. Describe different type synchronous pacemaker.

$$(4 + 8) = 12$$

Group – E

8. (a) Describe the different ultrasonic transmission mode. Also describe different ultrasound scanning technique.

   (b) Describe various method of accident prevention.

$$(3 + 6) + 3 = 12$$

9. (a) What are the physiological parameters adaptable to bio-telemetry? Discuss about the components of bio-telemetry?

   (b) What is EEG? Specify different EEG wave and their frequency.

$$(2 + 6) + (2 + 2) = 12$$

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