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

Answer Q. No. 1 and <u>Any Two</u> from each Group A and Group B.

Answer for both the groups to be given in same answer-script.

Q.1.   Fill in the blanks :   (1 x 10)

   (i)   There are _____ number of bones and _____ number of articular joints in human skeletal system.

   (ii)   Greatest ranges of motion can be achieved in the most _____ _____ _____.

   (iii)   The walls of the gastro-intestinal track is lined with _____ _____.

   (iv)   Antagonists are _____ which help in _____.

   (v)   The long process from a neuron is called _____.

   (vi)   Heart pumps _____ beats/min. and pumps about _____ of blood.

   (vii)   Semilunar valves guard the origin of _____ and _____.

   (viii) The growth of femur upward in a condition called _____.

   (ix)   The compact region of the bone is called _____ _____ while the spongy region is called _____ _____.

   (x)   Between left atrium and left ventricle the bicuspid valve is known as _____ _____.

Group A

(Answer any two)

2.(a) Determine the hip joint forces during walking for the foot on stance phase.

   (b) Explain : How use of cane helps during recovery after hip surgery.   (10 + 5)

3.(a) Derive a dynamic relationship between the pressure 'p' applied to a fluid filled Catheter tip and the output voltage E of a pressure transducer.

   (b) Calculate the fundamental frequency of vibration of a typical Cortical bone, given that KL = 1.8751 for fundamental mode, Specific weight of bone 19.52 kN/m^3. Young's modulus 22 GPa, cross-section and length of the bone sample 2.5 mm x 2.5 mm and 10 cm respectively.   (8 + 7)

4. Derive an expression for pulse-wave propagation velocity through artery. State the assumptions in deriving the above relation. (15)

5.(a) State the function of skeletal in human body. Discuss different types of joints and their movement in human body.

(b) Describe the different kinds of muscle tissues in human body and briefly explain the following terms related to muscle contraction (i) sarcomere (ii) thick and thin filaments (iii) action potential (iv) isotonic and isometric contractions. (7 + 8)

6.(a) With a schematic diagram describe the circulatory system of human body and its function.

(b) Describe different characteristics of soft tissues and their mathematical modellings. (7 + 8)

7.(a) Discuss different mechanical events of the cardiac cycle related to ECG recording.

(b) Estimate the power developed by heart during activity and at rest using the following data :
Left ventricular pressure p_L = 100 mm of Hg, volume rate of flow at rest Q = 3.5 lit/minute and at active phase Q = 35 lit/minute. Density of blood 1 gram/cc and cross-sectional area of heart valve = 0.81 cm^2. (7 + 8)