B. Tech.

(SEM. VIII) EXAMINATION, 2006-07

FUNDAMENTALS OF BIOMEDICAL ENGINEERING

Time : 3 Hours] [Total Marks : 100

Note : (1) Attempt all questions.
      (2) All questions carry equal marks.

1  Attempt any two out of the following : 10×2=20
   (a) Describe the biomechanics of hip joint.
   (b) What is prosthesis? Describe its mechanical aspect as applied to hip joint.
   (c) With the help of a neat diagram, explain the type of forces and moments can be supported by knee joint?

2  Attempt any two out of the following : 10×2=20
   (a) What do you understand by bio-compatibility? Enumerate the characteristics of a material to be biocompatible. Illustrate your answer with suitable examples.
   (b) What kind of role is played by soft tissues? Describe the surface and fatigue properties of skin.

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(c) Classify biopolymers along with their properties. How far these biopolymers find their suitability with respect to skin.

3 Attempt any two out of the following: 10 x 2 = 20

(a) (i) Draw the curves showing the variation of shear stress with velocity gradient for certain groups of Non-Newtonian fluids. Give examples of each.

(ii) With the help of a neat diagram, show how boundary layer is developed for case of flow in a circular pipe under laminar and turbulent conditions.

(b) If a person stands up does his BP increases. Why? In what way each of four chambers of heart is different from others in functioning?

(c) What is meant by joint friction? What factors are responsible for this? Discuss possible difficulties that are encountered by human body.

4 Attempt any two out of the following: 10 x 2 = 20

(a) Discuss the major differences encountered between measurements in a physiological system as distinct from a physical system. What are the objectives of medical imaging and what are its four main areas of detailed examination?

(b) Draw an electrocardiogram (in lead II) labelling the critical features. Include typical amplitudes and time intervals for a normal person.
(c) Discuss the relative difference between high and low frequency ultrasound. An ultrasonic imaging system is capable of operating at both 5Hz and 12.5Hz. What is the advantage of being able to select between two frequencies? Under what circumstances would you use each?

(d) X-Ray and Radio-isotope method for diagnostic purposes both make use of the penetrating properties of radiation. What is the principal difference between two methods?

(e) What do you understand by magnetic resonance? Discuss its clinical application.

(f) What is a physiological resistance transducer? Describe its operation. List some biomedical applications.

5 Attempt any two out of the following: 10×2=20

(a) What is the purpose of telemedicine? What role does bioinformatics play in the area of biomedical engineering?

(b) Explain the significance of data collection and medical coding.

(c) Describe different client/server topologies that are in recent use.

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