Total No. of Questions : 6]

SEAT No. :

P4191

[Total No. of Pages : 2

[4960]-52

M.E. (Civil) (Structures)

BIOMECHANICS AND BIOMATERIALS

(2008 Pattern) (Semester - II) (Elective - IV)

Time : 4 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Solve any two questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right side indicate full marks.***
5) ***Use of non programmable Calculator is allowed.***
6) ***Assume suitable data if necessary.***

SECTION - I

Q1) a) Explain Bone tissue structure with suitable sketch. Explain engineering material properties as applicable to hard tissue. **[8]**

b) Explain various elasticity models applicable to tissue. Draw suitable line diagram to illustrate the same. **[9]**

c) Define Biomechanics, advantages of its study and applications. **[8]**

Q2) a) Explain Biomaterial. Compatibility of biomaterial. Enlist at least five bio compatible materials and its suitable use in treatment of biomechanics related problem. **[8]**

b) Explain various non metallic materials used as bio compatible materials with its Advantages and application. **[9]**

c) What are articulating surfaces? Explain any one of it with suitable sketch and free body diagram. **[8]**

Q3) a) Explain bone cement as biomaterial. What are its limitations. **[8]**

b) Explain properties of UHMWPE as prosthesis material. **[9]**

c) Explain properties of stainless steel, cobalt base alloys, Titanium base alloys when used as prosthesis material. **[8]**

P.T.O.

SECTION - II

Q4) a) Explain in brief anisotropy, transverse isotropy, orthotropy for bone tissue. **[9]**

b) Sketch geometry Knee joint, Show joint forces acting, contact surfaces area possible for different positions. Write the joint equilibrium equation. **[9]**

c) Explain device to measure wear of cartilage on cartilage material. **[7]**

Q5) a) Explain human gait with suitable sketches, importance of gait study. **[8]**

b) Enlist and explain various measurement techniques for body motion. **[9]**

c) In which situation correction of gait is inevitable, What are ways to correct the human gait. **[8]**

Q6) a) What are the fundamental design consideration for engineering design of Prosthesis. **[8]**

b) Explain step by step structural analysis and design steps of Hip joint, stem part. **[9]**

c) What is the classification of prosthetics devices? Enlist prosthetics widely used and the situations in which they are required to be used. **[8]**