Reg. No.											

MANIPAL INSTITUTE OF TECHNOLOGY

(A constituent unit of MAHE, Manipal 576104)

V SEM B.Tech (BME) DEGREE END-SEMESTER EXAMINATIONS, NOV-DEC 2018.

SUBJECT: BIOMATERIALS AND PROSTHETICS (BME 3103)
(REVISED CREDIT SYSTEM)
Wednesday, 21st November, 2018, 2 to 5 PM

TIME: 3 HOURS **MAX. MARKS: 50**

Instructions to Candidates:

1. **Answer ALL questions.**
2. **Use separate answer book for Biomaterials (Q.1-3) and Prosthetics (Q.4-5)**

1A. Explain "kelvin model'' of viscoelasticity of bone. 4

1B. What is the shear modulus for a polymer which behaves as a kelvin model if the shear strains are as follows? 3

Time (hour)	Shear strains
1	0.0060
2	0.0084
10	0.010
20	0.010

Shear stress is 10^6 Pa.

1C. Explain the different types of Co-polymer. 3

2A (i) Compare and analyze the role of carbon and chromium on the mechanical strength and corrosion behavior of austentic type of stainless steel. 5

(ii) Explain the conditions required for fabrication of Hydroxyapatite and Beta – Whitelockite. Highlight the advantages of coating a Ti based dental implant with hydroxyapatite.

2B	You are asked to extract collagen for the fabrication of a composite matrix. What type of isolation technique would be appropriate? Describe the steps in brief, and justify your choice. Will the orientation of the collagen fibres make any impact in the design of the composite matrix? Do the absence of proline and hydroxyproline in collagen molecule have any impact on its structure?	5
3A	Discuss the steps involved in the fixation of endosteal dental implant.	4
3B	Mention the causes for heart valve replacement? Analyze the pros and cons of mechanical and bio-prosthetic heart valves.	3
3C	Explain three ways by which polymers (synthetic degradable) can be rendered soluble.	3
4A	As a biomedical engineer, you are asked your opinion on the design of a new tilting disc heart valve fully made of Aluminum including the sewing ring. Discuss in detail, the pros and cons of using aluminum for each of the components of a heart valve.	3
4B	(i) Draw the basic design of a metal on plastic hip prosthesis, identify the parts and the materials used. (ii) Discuss, in detail, methods of fixing different parts of the implant to the hip and femur. (iii) What are the general causes of loosening of hip / knee implants?	4
4C	Explain the role of Glucagon in controlling the level of glucose in blood.	3
5A	With necessary diagrams, explain, in detail, the function of an IABP system, its parts and where, why and how it is used.	5
5B	What will be the design requirements of such a system? Separately deal with the electronic modules, balloon and so on. Focus on the functional and technical design of each part of the system.	5