Reg. No.											

MANIPAL INSTITUTE OF TECHNOLOGY

(A constituent unit of MAHE, Manipal 576104)

V SEMESTER B.Tech (BME) DEGREE MAKE UP EXAMINATIONS, DEC/JAN 2019-20

SUBJECT: BIOMATERIALS AND PROSTHETICS (BME 3103)
(REVISED CREDIT SYSTEM)
Saturday, 21st December, 2019: 2 PM 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 Artificial Organs (Q.4-5)**

1A. Classify different types of composite materials. 3

1B. Explain the role of the following factors on the mechanical properties of polymer 4
(i) Tacticity, (ii) glass transition temperature.

1C. Compare the following 3

(i) Step growth and chain growth polymerization.

(ii) 316 stainless steel and 316L stainless steel.

2A. Mention the causes of heart valve replacement. Analyze the pros and cons of mechanical and bio-prosthetic heart valves. 2+3

2B. Discuss the steps involved in the fixation of dental implants. 5

3A. Using a spring and Newtonian dashpot, derive an expression for viscoelastic behavior of bone applies to Voight model. 5

3B. What is hemi hip prosthesis? Discuss the steps involved in the fixation of dental implants. 1+4

4A.	What are ligaments and tendons and what role do they play in human locomotion.	1
4B.	The concept of mobile and fixed bearing knee has been explained in the class. Using the same logic, why don't we have a mobile hip?	1
4C.	A patient uses an insulin pen and administers periodic dose? What problems do you see in such an approach in the control of glucose?	1
4D.	You are designing a Dialysis machine. Discuss the safety / control mechanisms you will implement in such a machine. Explain why these are necessary? Assume that the machine is electrically safe.	4
4E.	What are the short and long term problems associated with an all metal hip implant?	3
5A.	Explain Type 1 and Type 2 diabetes.	1
5B.	Draw the diagram of a complete pulse duplicator for testing heart valves, explain the function of each component and how this is achieved.	2+3
5C.	Explain the design of Charley hip prosthesis – the design of the acetabular cup, the spacer, the head and the stem.	3
5D.	How is a mobile bearing knee and different from a fixed bearing knee? Explain with diagrams. Where are they used?	1