Reg. No.					



MANIPAL INSTITUTE OF TECHNOLOGY

(A constituent unit of MAHE, Manipal 576104)

II SEMESTER M.Tech (BME) DEGREE END SEM EXAMINATIONS, APR/MAY, 2019 SUBJECT: BIOMATERIALS & ARTIFICAL ORGANS (BME 5231) Elective I (REVISED CREDIT SYSTEM) Monday, 29th April 2019: 9 am to 12 noon

TIME: 3 HOURS

MAX. MARKS: 50

Instructions to Candidates:

- 1. Answer all the questions.
- 2. Draw labelled diagrams wherever necessary.
- **3.** Biomaterials questions from 1(a) to 3(a) and Artificial Organs questions from 3(b) to 5(c). Use separate answer books for Biomaterials and Artificial Organs.
- 1. (a) Explain the local and systemic host response towards biomaterials implanted within 04 the human body
 - (b) Discuss in detail various methods to prevent the adsorption of protein on the implant 03 surface
 - (c) Propose various methods to make biomaterial surface resistant to biofilm formation 03
- (a) Suppose you want to evaluate the blood compatibility of a polymer used for making a 04 blood-contacting medical device. Elaborate on various methods to test hemocompatibility of the polymer
 - (b) Discuss briefly various small animal models used in biomaterial testing 03
 - (c) Elaborate on oxidative biodegradation of polymeric biomaterials within the human 03 body.
- 3. (a) Compare in detail the shape memory effect and superelasticity of nickel-titanium 05 alloys (Nitinol).
 - (b) You have designed a polymeric scaffold loaded with insulin. Discuss the 03 appropriateness of such a system as an implantable insulin pump.
 - (c) In what type of application would such a polymer scaffold loaded with drugs (not insulin) be more appropriate? Discuss any one application.

- 4. (a) With necessary diagrams, explain, in detail, the function of an external counter 05 pulsation system, its parts and where, why and how it is used.
 - (b) What are the basic clinical problems encountered in peritoneal dialysis? 02
 - (c) Explain the terms diffusion, convection, hemofiltration and ultrafiltration as applied to 03 the context of peritoneal dialysis. If not applicable, explain the reasons for it.
- 5. (a) Choose any implantable or extracorporeal device as an example and clearly explain 05 the process of validation of the chosen device step by step.
 - (b) (i) Draw the basic design of a Charnley's hip prosthesis, identify the parts and the 3+1+1 materials used.

(ii) Briefly discuss methods of fixing different parts of the implant to the hip and femur.

(iii) What are the general causes of the loosening of implants?