Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

A Constituent Institution of Manipal University

II SEMESTER M.TECH (BME) DEGREE MAKE UP EXAMINATIONS JUNE, 2018
SUBJECT: BIOMATERIALS AND ARTIFICIAL ORGAN (BME 5231)
(REVISED CREDIT SYSTEM)

Tuesday, 19th June 2018: 9 AM to 12 Noon

TIME: 3 HOURS **MAX. MARKS: 100**

Instructions to Candidates:

Answer all five full questions.
Use separate answer book for Biomaterials (Q.1-3) and Artificial Organ (Q. 4-5)

1A.	What is creep in the context of viscoelastic model of a material? Using a spring and Newtonian dashpot, derive an expression for the viscoelastic behavior of bone applies to Maxwell model.	**8**
1B.	Explain the role of the following factors on the mechanical properties of polymer (i) Tacticity, (ii) crystallinity, (iii) glass transition temperature, (iv) molecular weight.	**8**
1C.	Compare different types of ceramics.	**4**
2A.	Explain 'stenosis' and 'regurgitation'. Analyze the pros and cons of mechanical and bioprosthetic heart valves.	**4+4**
2B.	Compare the rule of mixture and inverse rule of mixture apply to fiber reinforced composites.	**6**
2C.	Classify different types of composites. Why is PHEMA preferred over PMMA for soft contact lens design? Explain.	**3+3**
3A.	Mention the steps involved in investment casting of Co-Cr based alloy.	**5**
3B.	What do you mean by Total Hip Arthoplasty (THA)? Discuss the steps involved in the fixation of THA.	**6**

3C. Compare: (i) chain growth polymerization and step growth polymerization, (ii) thermoplastic and thermosetting, and (iii) bulk erosion and surface erosion. **3x3**

4A. With a diagram, explain the working of an accelerated wear tester for heart valves; the need for such testing and how accelerated testing is achieved in the wear tester. **6+2+4**

4B. A new heart valve under development has high opening pressure and high forward flow resistance but has very low regurgitation in a pulse duplicator. What will be the clinical implication if the valve is approved for mitral or aortic replacement? (In other worlds, how will it affect the patients?) **5**

4C. List three key problems encountered in using an External Counter Pulsation Device for cardiac support. **3**

5A. What is Transmembrane Pressure in the context of a hemodialyser? **2**

5B. What is ultrafiltration? Why is this used? How is it achieved during hemodialysis? How is the problem solved in peritoneal dialysis? **2+4+2+4**

5C. You are asked to design an implantable insulin pump. Briefly discuss a few points you will take into consideration in designing such a pump. **6**