Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

A Constituent Institution of Manipal University

II SEMESTER M.Tech (BME) DEGREE MAKE-UP EXAMINATIONS JUNE 2017
SUBJECT: BIOMATERIALS AND ARTIFICIAL ORGAN (BME 5231)
(Elective I)
(REVISED CREDIT SYSTEM)

Saturday, 17th June 2017: 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) cross-linker as additive, (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 clear and neat diagram, explain the working of a bubble oxygenator. Label all parts and explain the function of each part clearly. What are the factors in the physical structure of the oxygenator that affect its performance? **10**

4B. Compare a tissue valve with a prosthetic valve, in terms of its performance, short term and long term clinical use and problems associated with each. **5**

4C. What are the significant factors that make users prefer a disc valve over a ball valve? **5**

5A. Draw a schematic of the normal hemodialysis circuit. Explain how dialysis takes place in a cartridge. **6**

5B. What is counter current flow? Why is it used? Explain this in relation to Hemodialysis cartridge. **4+4**
What is a 'boundary layer' problem? Explain this in the context of a membrane oxygenator?

5C. Compare hemodialysis and peritoneal dialysis in terms of performance and problems. **6**