Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

A Constituent Institute of Manipal University, Manipal

VII SEMESTER B.TECH (MECHANICAL/IP ENGG.) END SEMESTER EXAMINATIONS, DECEMBER 2017

SUBJECT: COMPOSITE MATERIALS [MME 4005]

REVISED CREDIT SYSTEM

Time: 3 Hours MAX. MARKS: 50

Instructions to Candidates:

- Answer **ALL the** questions.
- Missing data may be suitably assumed.

1A. i. Define composite materials. Give two examples each for natural composites and man-made composites respectively. **05**

ii. List the desirable properties of matrix and reinforcement phases in a composite material.

1B. With regard to glass fibers answer the following questions: **05**

i. List four reasons why glass fibers are commonly used for reinforcement.

ii. Why is the surface protection of glass fibers so important? And what measures are taken for surface protection?

2A. A continuous and aligned glass fiber reinforced composite consists of 40 vol% of glass fibers having a modulus of elasticity of 69 GPa and 60 vol% of a polyester resin that, when hardened, displays a modulus of 3.4 GPa. **05**

i. Compute the modulus of elasticity of this composite in the longitudinal direction.

ii. If the cross-sectional area is 250 mm^2, ratio of fiber load to matrix load is 13.5 and a stress of 50 Mpa is applied in this longitudinal direction, compute the magnitude of the load carried by each fiber and matrix phases.

iii. Also determine the strain that is sustained by each phase for the above condition.

2B Sketch and explain Vacuum Bagging. Also list its advantages, disadvantages and applications **05**

3A. Sketch and explain pultrusion technique of manufacturing fiber reinforced polymers. State its advantages and disadvantages. **05**

3B. Explain the different stages involved in powder metallurgy technique of manufacturing MMCs. **05**

4A. Illustrate and explain the toughening mechanisms in CMCs. **05**

4B. With regard to squeeze casting answer the following: **05**

i. Sketch and explain the squeeze casting process.
ii. SiC used as reinforcement in Al matrix are prone to react with Al forming a compound Al_4Si_3, which is detrimental in many applications. Squeeze casting reduces the chances of formation of this compound. Explain how is this inhibited? What other way can you inhibit the formation of Al_4Si_3?

5A. Sketch and explain Chemical Vapor Infiltration technique of manufacturing CMCs. Also state its advantages and disadvantages. **05**

5B. What are nanocomposites? Differentiate between nanocomposites and conventional composites. **05**