Reg. No.

MANIPAL INSTITUTE OF TECHNOLOGY

VII SEMESTER B.TECH (MECHANICAL/IP ENGG.) END SEMESTER

EXAMINATIONS, NOVEMBER 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.** What is a composite material? What are its advantages over other class of **03** materials?
- **1B.** Explain the role of matrix and reinforcement phases in a composite material. **03** Also enumerate the advantages of using fibers as a reinforcement phase over particulates and whiskers.
- **1C.** Differentiate between lamina and laminate? With a neat sketch explain the **04** filament winding technique of processing PMC's.
- **2A.** Using Rule of Mixtures approach, derive equations for density of composite in **03** terms of volume fraction and mass fraction respectively.
- **2B** A thermoplastic matrix contains 40 wt. % matrix. If the density of the matrix is **02** 1.1gm/cc while that of glass fiber is 2.5gm/cc, what is the density of the composite? Assume that no voids are present and mass of the composite is100gm.
- **2C.** With proper representative sketches derive expressions for Young's modulus of **05** fiber reinforced composite in iso-stress and iso-strain conditions.
- **3A.** Explain briefly the need to develop Metal Matrix Composites (MMC's). Sketch **05** and explain Duralcan casting process of MMC's
- **3B.** With a schematic explain squeeze casting technique of processing MMC's. **05** Also explain how the formation of Al_4C_3 is prohibited to minimize its detrimental effect.
- **4A.** Briefly explain the mechanical properties of MMC's and also list out its **05** applications.
- **4B.** What are ceramics? How is Ceramic Matrix Composite (CMC's) different from **05** monolithic ceramics? Explain.
- **5A.** What are the challenges in processing of Ceramic Matrix Composites? Sketch **05** and explain Slurry Infiltration Process (SIP) technique of processing CMC's.
- **5B.** What are nanocomposites? Differentiate between nanocomposites and **05** conventional composites.