Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

(A constituent unit of MAHE, Manipal)

VII SEMESTER B. TECH (MECHANICAL/IP ENGG.) END SEMESTER EXAMINATIONS, NOVEMBER 2018

SUBJECT: COMPOSITE MATERIALS [MME 4005]

REVISED CREDIT SYSTEM

Time: 3 Hours MAX. MARKS: 50

Instructions to Candidates:

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

1A. Define composite materials. Discuss the properties and applications of carbon fiber reinforced polymer composites and compare it with aramid fiber composites. **05**

1B. Discuss the application of fiber reinforced polymer composites in sporting goods. **05**

2A. Sketch and explain laminar composites and sandwich panels. **05**

2B. A continuous and aligned fibre-reinforced composite is to be produced consisting of 60 vol% aramid fibres in polycarbonate matrix. Mechanical properties are as follows:

- Modulus of elasticity for aramid fibre = 131 GPa
- Modulus of elasticity for polycarbonate = 2.4 GPa

Assume that the composite has a cross-sectional area of 320 mm^2 and is subjected to a longitudinal load of 44500 N.

Calculate:

a) The fibre-matrix load ratio
b) The actual loads carried by both fibre and matrix
c) The magnitude of the stress on each of the fibre and matrix
d) What strain is experienced by the composite? **05**

3A. Sketch and explain filament winding process. Also state its advantages, disadvantages and applications. **05**

3B. i. Explain why monolithic ceramics need reinforcement? Explain the difference between the role of interface between a polymer matrix and ceramic matrix composite. **(2.5)**

ii. Sketch and explain the phase transformation toughening in zirconia toughened alumina composite. **(2.5)** **05**

4A. Differentiate between sheet molding compound and bulk molding compound. Sketch and explain the compression molding process. **05**

4B. Discuss the properties and applications of metal matrix composites. Sketch and explain squeeze casting process. **05**

5A. Discuss the application of fiber reinforced polymer composites in aerospace and military applications. **05**

5B. Sketch and explain chemical vapor infiltration. Also state its advantages and disadvantages. **05**