Reg. No.										

Manipal Institute of Technology, Manipal

(A Constituent Institute of Manipal University)

VII SEMESTER B.TECH (MECHANICAL ENGINEERING)

END SEMESTER (MAKE UP) EXAMINATIONS, DEC 2015 / JAN 2016

SUBJECT: COMPOSITE MATERIALS [MME 471]

REVISED CREDIT SYSTEM

Time: 3 Hours MAX. MARKS: 50

Instructions to Candidates:

- Answer **ANY FIVE FULL** the questions.
- Missing data may be suitable assumed.

1A. Give any three differences between composites and alloys. **(3)**

1B. How is boron fibre manufactured? Explain with a sketch. **(3)**

1C. A polymer matrix composite is reinforced with 45% vol. of glass fibres. Elastic modulus of the matrix and the fibre are 6 GPa and 72 GPa respectively. Find the percentage load carried by the fibre if a load of 150 kg is applied. Determine the elastic modulus of the composite in a direction parallel as well as perpendicular to the fibre direction. **(4)**

2A. List down any three advantages and disadvantages of bonded joints in composite materials. **(3)**

2B. Discuss the different types of impact tests that can be conducted on PMCs. **(3)**

2C. Explain the process RTM and Filament Winding used in fabricating PMC with neat sketches. **(4)**

3A. Explain the demerits of lay-up processes used to manufacture of PMCs **(3)**

3B. How defects in composite materials are classified? Explain the commonly occurring defects under each category. **(3)**

3C. Explain steps involved in fabrication of Carbon-Carbon Composites by liquid phase infiltration and chemical vapour deposition techniques. **(4)**

4A. Discuss with illustrations, any three types of reinforcement that can be used in composite materials. **(3)**

4B. Explain with neat sketch polymer infiltration and pyrolysis used in fabrication of CMC. **(3)**

4C. A thermoplastic matrix contains 40 % wt. glass fibres. If the density of the matrix is 1.1 g/cm^3, while that of the glass fibre is 2.5 g/cm^3, what is the density of the composite? Also, determine the upper limit of specific stiffness. Young's Modulus for matrix and fibres is 110 GPa and 407 GPa respectively. **(4)**

5A. Explain any three liquid state fabrication techniques used in manufacturing of MMC. **(3)**

5B. Explain Injection Moulding technique used in fabrication of PMC. **(3)**

5C. Define the following terms: **(4)**

i. Glass Transition Temperature
ii. Sintering
iii. Fibre Volume Fraction
iv. Elastic Modulus

6A. Explain the term eutectic system with a phase diagram and hence explain manufacturing of MMC using in-situ technique with help of a sketch. **(3)**

6B. Name the ASTM standard referred for Tensile testing of PMC. Explain the testing in brief. **(3)**

6C. Explain in detail, Thermography and Microscopy inspection used in NDT of composite materials. **(4)**