

MANIPAL INSTITUTE OF TECHNOLOGY MANIPAL

A Constituent Institution of Manipal University

VII SEMESTER B.TECH. (MECHANICAL ENGINEERING) END SEMESTER EXAMINATIONS, NOV/DEC 2016

SUBJECT: COMPOSITE MATERIALS [MME 471] (PE-IV)

REVISED CREDIT SYSTEM (30/11/2016)

Time: 3 Hours

MAX. MARKS: 50

Instructions to Candidates:

- Answer **ANY FIVE FULL** questions.
- Missing data may be suitably assumed.
- 1A. Write a short note on the application of composites in aerospace, automobile (3) and chemical industry.
- **1B.** With a neat sketch explain the manufacturing process of carbon fibers. (3)
- Write a short note on microscopy and ultrasonic inspection of Composite (4) materials.
- 2A. Write any six advantages and disadvantages of bonded joints. (3)
- 2B. A S-glass fiber reinforced vinyl Easter composite has an elastic modulus of (3) 150 GPa. The elastic moduli and specific gravities of reinforcement and matrix 450 GPa and 7 GPa and 1.89 and 1.24 respectively. Determine the Fiber volume fraction and elastic modulus of composite in transverse direction.
- **2C.** Explain with a neat sketch, the manufacturing process of Aramid fibers. (4)
- **3A.** Explain the testing procedure and conditions followed in ASTM D2344 for **(4)** PMC.
- **3B.** Explain the mechanism of crack deflection in CMC. (2)
- **3C.** With a neat sketch explain different types of CVI process used in CMC. (4)
- 4A. Discuss Vacuum Bagging process with the help of a sketch. List and explain (4) the use of the various components used in the process.

- 4B. Explain the standard testing procedure and conditions followed for flexural (4) testing of PMC.
- **4C.** Write a short note on BVID and CVID.
- 5A. With a neat sketch explain what is coupling agent. What is its significance in (3) PMC, MMC and CMC?
- **5B.** With neat sketches write a note on Satin and Twill fabrics. (4)
- 5C. With assumptions derive an expression to find the Modulus of elasticity in (3)PMC, when the load is applied in transverse direction.
- 6A. A matrix contains 40% weight of E-glass fibers. If the density of the matrix is (3)
 1.1 g/ cm³, while of the reinforcement is 2.5 g/ cm³. The UTS of fiber diameter 180 μ dia is 2 GPa and matrix flow stress on fiber surface is 60 MPa. What is the density of the composite? Assume the required data.
- **6B.** Write a short note on classification of composite materials based on **(4)** Reinforcement.
- **6C.** With a neat sketch explain the sol-gel process for CMC manufacturing. (3)

(2)