

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER-VIII • EXAMINATION – SUMMER • 2015****Subject code: 182103****Date:05/05/2015****Subject Name: Composite Materials****Time : 10.30AM-01.00PM****Total Marks: 70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

- Q.1** (a) Classify composite materials as dispersion strengthened, particulate & fiber reinforced on the basis of size & shape of reinforcing phase & evaluates them. **07**
- (b) Why composite materials is separated from the three basic classes namely polymeric, ceramic & metallic materials. **07**

- Q.2** (a) What do you mean by fiber? What is significance of L/D ratio? What is critical length (l_c) of fiber? **07**
- (b) Discuss in detail the strengthening mechanism in composites. **07**

OR

- (b) Describe the toughening mechanism in MMC. **07**
(Metal Matrix Composites)

- Q.3** (a) A continuous & aligned glass fiber reinforced composites consists of 50 volume % of glass fiber having a modulus of elasticity of 10×10^6 psi & 50 volume % of a polyester resin that, when hardened, displays a modulus of 5×10^5 psi. **07**
- (a) Compute the modulus of elasticity of this composite in longitudinal direction. (b) If cross sectional area is 0.6 square inch & a stress of 5000 psi is applied in this longitudinal direction, compute the magnitude of load carried out by each of fiber & matrix phase. (c) Determine the strain that is sustained by each phase when stress in part b is applied
- (b) List different fabrication methods of polymer matrix composite (PMC) & explain any one. **07**

OR

- Q.3** (a) Derive an expression of rule of mixture to calculate stresses on composites. **07**
- (b) Describe fabrication techniques for ceramic matrix composites (CMC). **07**
What are advantages of ceramic matrix composites over other two classes of composites?

- Q.4** (a) i) What do you mean by wet ability of reinforcing phases? How it can be expressed? **04**
- ii) Production of whiskers & their applications. **03**
- (b) Explain stages of manufacturing of carbon fibers. **07**

OR

- Q.4** (a) i) With neat sketch explain zones formed at interface of composites. **04**

- ii) Name two different techniques of manufacturing of Boron fibers. **03**
 Explain principles?
- Q.4 (b)** With suitable Example explain manufacturing of metal matrix composites. **07**
- Q.5 (a)** i) What do you mean by prepeg? How they are used for manufacturing polymer matrix composites? What are their advantages? **04**
 ii) Discuss manufacturing of helicopter by vacuum bag molding technique. **03**
- (b)** Do as directed :- **07**
- i) Volume of second phase particle in particle reinforced composite is _____.(Fill in the blank)
 - ii) Name two specific properties that make composites attractive for structural application.
 - iii) What fiber factors contribute to mechanical performance of composite?
 a) length (b) orientation (c) shape (d) all of above
 - iv) Give example of two SAP materials.
 - v) Diameter of second phase particle in dispersion reinforced composite is _____.(Fill in the blank)
 - vi) Bullet proof vests use _____ fibers.
 (a) Kevlar (b) graphite (c) boron (d) glass.
 - vii) The most common fiber used in advance polymer composites are _____.
- (a) glass, steel & aluminum (b) glass, graphite & Kevlar
 (c) glass, steel & Kevlar

OR

- Q.5** Attempt any four:- **14**
- i) Describe in detail flakes, whiskers & fibers.
 - ii) Tests for measuring interfacial strength.
 - iii) Draw & explain schematic of glass fiber manufacture.
 - iv) Fabrication of boron halide with figure.
 - v) Fabrication of fiber reinforced plastics.
 - vi) Dry jet wet spinning process of producing aramid fibers.
