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Question Paper Code : 31042

B.E./B.Tech. DEGREE EXAMINATION, MAY/JUNE 2013.

Fifth Semester

Mechanical Engineering

10.5.13-8

080120028 — COMPOSITE MATERIALS

(Common to 080190042 – Composite Materials for Seventh Semester –
Automobile Engineering)

(Regulation 2008)

Time : Three hours

Maximum : 100 marks

PART A — (10 × 2 = 20 marks)

1. Explain the difference between composite material and ceramic material.
2. What are the limitations of metal matrix composites?
3. What are the advantages and limitations of epoxy matrix?
4. Which is the preferred fiber material for high temperature applications justify the answer?
5. What are the advantages and limitations of using composite material for helicopter rotor blade?
6. Give the difference between carbon and graphite fibers.
7. What are the advantages of using in situ process for manufacture of composites?
8. Draw the stress strain curve for a composite material.
9. Does a creep failure occur in laminated composites.
10. What is the use of laminated plate theory?

PART B — (5 × 16 = 80 marks)

11. (a) (i) Give a detailed account of classification of composites based on structure of composite materials and give four applications for each type of composites. (8)
(ii) Explain in detail different matrix materials by giving their applications and advantages. (8)

Or

- (b) (i) Discuss in detail different fiber materials by giving their properties and applications. (8)
- (ii) Explain the effect of surface roughness, temperature and moisture on the properties of composite materials. (8)

12. (a) (i) Explain in detail manufacture of glass fibers. (8)
- (ii) Give a detailed account of manufacture of carbon fibers. (8)

Or

- (b) (i) Discuss in detail production of SiC whiskers. (8)
- (ii) Explain in detail processing of Aramid fibers. (8)

13. (a) (i) Discuss in detail compression moulding processes used in the manufacture of composite materials. (8)
- (ii) Explain reaction injection moulding process with a neat sketch. (8)

Or

- (b) (i) Discuss in detail filament winding process with a neat sketch. (8)
- (ii) Explain in hand layup process with a neat sketch. (8)

14. (a) (i) Derive the rule of mixtures for calculating the young's modulus of an aligned fiber reinforced composite loaded parallel to the direction of fiber orientation. (8)
- (ii) A graphite / epoxy composite specimen has dimensions of 3.81 cm × 2.54 cm × 0.3 cm and a weight of 4.47 gm. After "resin digestion" in an acid solution the remaining graphite fibers weight 2.38 gm. From independent tests, the densities of the graphite fibers and epoxy matrix is found to be 1.9g/cm³ and 1.2g/cm³ respectively. Determine the volume fractions of fibers, epoxy matrix and voids in the specimen. (8)

Or

- (b) (i) Derive an expression to find out the Tsai-Hill failure criteria. (8)
- (ii) Explain in detail classical lamination theory. (8)

15. (a) Explain in detail different types of joints used for composite structures. (16)

Or

- (b) (i) Give a detailed account of hybrid composites by giving the method of advantages and applications. (8)
- (ii) Discuss in detail factors affecting fatigue and testing of fatigue strength of composites. (8)