

Eighth Semester Examination – 2008

COMPOSITE MATERIALS

Full Marks – 70

Time : 3 Hours

*Answer Question No. 1 which is compulsory
and any **five** from the rest.*

*The figures in the right-hand margin
indicate marks.*



1. Answer the following questions : 2 × 10
 - (a) What are some of the most commonly used fibre types ?
 - (b) How are the fibres arranged within a composite ?
 - (c) What determines the mechanical and thermal properties of a composite ?

- (d) What are some of common types of matrix materials ?
 - (e) What do you understand by reinforced plastics ?
 - (f) In addition to acting as binders, do resins have any other function ?
 - (g) What is meant by quasi-isotropic laminates ?
 - (h) Name the factors that affect the longitudinal strength and stiffness of a composite material.
 - (i) Define the term 'aspect ratio' for a fibre.
 - (j) What are the advantages and disadvantages of glass-fibre as a reinforcing material ?
2. How composite materials are classified ? Discuss the relative merits and demerits of polymer composites with regards to metals and ceramics. 10
 3. (a) How do you distinguish between thermosetting and thermoplastic polymers ? 3

- (b) Describe the hand-lay-up technique for fabrication of fibre reinforced polymer composites. 7
4. A burn out test was performed to determine the volume fractions of the constituents in a glass fibre reinforced epoxy composite. The following observations were made :
- Weight of the crucible = 47.6504 gm
 Weight of the crucible and a small piece of composite = 50.1817 gm
 Weight of the crucible and glass after the burnout = 49.4476 gm.
- Calculate the weight and volume fraction of glass fibres and epoxy resin. Assume that the densities of the fibres and the resin are 2.5 and 1.2 gm/cc respectively. Also calculate the density of the composite. 10
5. (a) What do you mean by orthotropic materials? How do they respond to tensile and shear loads ? 5
- (b) Describe the stress strain relationship for an orthotropic lamina. 5
6. (a) Discuss different failure modes of unidirectional fibre reinforced composites. 5
- (b) Calculate the ratios of longitudinal modulus of the composite to the matrix modulus for glass-epoxy and carbon-epoxy composites with 10 and 50 % fibres by volume. Elastic moduli of glass fibres, carbon fibres and epoxy resin are 70, 350 and 3.5 GPa, respectively. 5
7. What is meant by laminated composites ? Discuss the fabrication of three different orthotropic laminates ; unidirectional, cross-ply and angle-ply types. 10
- 8 Write short notes on : (any two) 5×2
- (a) testing of composites
- (b) randomly oriented short fibre reinforced composites
- (c) fillers and additives in composites
- (d) bio-composites and hybrid composites.

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