

**B.Tech. AEROSPACE ENGINEERING
(BTAE)**

Term-End Examination

00615

December, 2014

BAS-022 : COMPOSITE MATERIALS

Time : 3 hours

Maximum Marks : 70

*Note : Attempt any **seven** questions. All questions carry equal marks. Use of scientific calculator is permitted.*

1. (a) What are ceramic-matrix composites ?
Explain briefly. 5
- (b) What are 'Laminates' ? Give examples. 5
2. (a) Define the term 'Ceramics'. How are ceramics classified ? 5
- (b) Calculate the volume ratio of aluminium and boron in Al-Boron composite which can have the Young's modulus equal to that of iron. Young's modulus of aluminium, iron and boron are 71 GN/m^2 , 210 GN/m^2 and 440 GN/m^2 respectively. 5
3. (a) What is 'Polymorphism' ? Explain briefly. 5
- (b) Define 'Glass'. What is the structure of glass ? 5

4. (a) State the classification of glass. What are the uses of glass ? 5
- (b) What is a composite material ? How are composite materials classified ? 5
5. (a) Classify polymeric materials, showing the main features of each class. 5
- (b) Discuss the factors affecting crystallinity of polymeric materials. 5
6. (a) Differentiate between a composite and an alloy. 5
- (b) What are the major preparation methods for most used fibers and what are their main characteristics ? 5
7. (a) Compare fibers and particles or flakes as reinforcing materials, giving examples. 5
- (b) What are the different combinations of particulate composite materials ? Give examples of each. 5
8. (a) What is the effect of volume fraction of fibers in PMCs, and what are the theoretical and practical limits for this fraction ? 5
- (b) Calculate the modulus of elasticity for a composite material consisting of 60 percent by volume of continuous E-glass fiber and 40 percent epoxy resin for the matrix when stressed under isostress conditions. (i.e. the material is stressed perpendicular to the continuous fiber). The modulus of elasticity of the E-glass is 72 GPa and that of the epoxy resin is 3 GPa. 5

9. (a) A piece of wood containing moisture weighs 163.8 g and after oven drying to a constant weight, weighs 147.5 g. What is its percent moisture content ? 5
- (b) A metal-matrix composite is made with 80 percent by volume of aluminium alloy 2124-T6 and 20 percent by volume of SiC whiskers. The density of the 2124-T6 alloy is 2.77 g/cm^3 and that of the whiskers is 3.10 g/cm^3 . Calculate the average density of the composite material. 5
10. (a) Give examples of metal-matrix composites, and identify their advantages over polymer-matrix composites. 5
- (b) Explain in brief the benefits of Non-Destructive Testing (NDT). Discuss X-Ray technique as an NDT. 5
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