

**B.TECH. AEROSPACE ENGINEERING  
(BTAE)****Term-End Examination****December, 2017****BAS-022 : COMPOSITE MATERIALS****Time : 3 hours****Maximum Marks : 70**

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- Note :** (i) *Attempt any seven questions.*  
(ii) *All questions carry equal marks.*  
(iii) *Use of scientific calculator is permitted.*
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1. (a) Explain briefly "Metal matrix composite". 5+5  
(b) Calculate the volume ratio of aluminum and boron in Al-Boron composite which can have the Young's modulus equal to that of iron. The Young's modulus of Al, iron, and boron are  $11 \text{ GN/m}^2$ ,  $210 \text{ GN/m}^2$ , and  $440 \text{ GN/m}^2$  respectively.
2. (a) Define the term "Ceramics". How are ceramics classified? What are the advantages of ceramic materials? 5+5  
(b) Explain briefly the various types of silicate structures.
3. (a) Fill-up the blanks with appropriate words : 5+5  
(i) Among metals the most important example of polymorphism is \_\_\_\_\_.  
(ii) \_\_\_\_\_ is any substance or mixture of substances that has solidified from the liquid state without crystallisation.

- (iii) Glass ceramics have very \_\_\_\_\_ coefficient of thermal expansion.
  - (iv) Silica is the principle constituent of \_\_\_\_\_.
  - (v) \_\_\_\_\_ is a Non-destructive testing.
- (b) State True/False for the following sentences :
- (i) Lime imparts durability to glass.
  - (ii) Glass has a sharp melting point.
  - (iii) The hardness of glass can be measured by Brinell or Rockwell machines.
  - (iv) The spun glass has tensile strength equal to that of mild steel.
  - (v) Radiography can be done using X-rays or  $\gamma$ -rays (both)
4. (a) What is the structure of glass ? List down 5+5 the properties of glass.
- (b) Explain briefly any two of the following advanced ceramics.
- (i) Glass ceramics
  - (ii) Dielectric ceramics
  - (iii) Electronic ceramics
  - (iv) Cermets.
5. (a) What is a composite material ? How are 5+5 composite materials classified ?
- (b) Explain briefly any two of the following composites
- (i) Particles - reinforced composites
  - (ii) Fibre-reinforced composites
  - (iii) Structural composites.

6. (a) What are 'laminates' ? Give examples. Also discuss in brief the surface coatings. 5+5
- (b) Name one natural fibre-reinforced composite and one human-made aggregate composite material. What is the large-scale use of the human-made aggregate composite material which acts as the matrix in such aggregate composite ?
7. (a) Define monomer and polymer. Write typical polymeric repeat unit structure for both addition and condensation polymerization. 5+5
- (b) What are the main property contributions of the carbon fibres in carbon-fiber-reinforced plastics ?
8. (a) Explain the techniques for non-destructive testing employed in ultrasonic testing. What are its advantages as compared to other methods of non-destructive testing ? 5+5
- (b) Explain X-ray technique as Non-destructive testing (NDT) method in brief. What are the advantages of X-ray technique as a NDT method ?
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