No. of Printed Pages : 3

BAS-022

B.Tech. AEROSPACE ENGINEERING (BTAE)

Term-End Examination

December, 2016

00123

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. Standard symbols and notations have usual meaning.*

1. (a) Describe the range of properties available in polyurethanes.

(b) Enumerate the steps involved in making a thermoplastic composite. *5+5*

2. (a) What is a glass and how is it different from a ceramic ? Explain.

(b) Distinguish between addition and condensation polymerization and state which is the better method. *5+5*

3. (a) Distinguish between thermoplastics and thermosetting plastics.

(b) What is meant by the term compounding of plastics ? What are the functions of the ingredients used in compounding of plastics ? *5+5*

4. (a) What is the difference between a polymer and a plastic ? Explain.

(b) What are the applications of fiber reinforced composites ? Explain. *5+5*

5. (a) What is degree of polymerization ? How are the rigidity and melting point of a polymer related to its degree of polymerization ?

(b) What are the two mechanisms of elastic deformation of elastomers such as rubber, which are absent in metals ? *5+5*

6. (a) What is meant by the hardness of a metal ? How is it determined ? Suggest any suitable method (NDT) to determine hardness index of a finished spur gear.

(b) What are the major advantages of NDT ? Describe any one of the NDT methods suitable for common flaws in casting. *5+5*

7. A unidirectional Kevlar 49 fiber-epoxy composite contains 62 percent by volume of Kevlar 49 fibers and 38 percent epoxy resin. The density of the Kevlar 49 fibers is 1·50 Mg/m^3 and that of the epoxy resin is 1·25 Mg/m^3.

   (a) What are the weight percentage of Kevlar 49 and epoxy resin in the composite material ?

   (b) What is the average density of the composite ?

5+5

8. (a) What are Ceramic-matrix composites ? Explain briefly.

   (b) What are 'Laminates' ? Give examples. *5+5*

9. (a) What is 'Polymorphism' ? Explain briefly.

   (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+5*

10. (a) Differentiate between a composite and an alloy.

   (b) Calculate the modulus of elasticity for a composite material consisting of 62 percent by volume of continuous E-glass fiber and 38 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+5*