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BAS-022

B.Tech. AEROSPACE ENGINEERING (BTAE)

Term-End Examination

00178

June, 2016

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) State three ways to improve the impact strength of plastics.

(b) Describe the mechanism of adhesion for polymers that are used as adhesives. *5+5*

2. (a) What are the most commonly used matrices for thermosetting composites ?

(b) What makes ceramics different from other engineering materials like metals, alloys and plastics ? *5+5*

3. (a) What do you mean by 'Composite materials' ? What are the general properties of polymeric materials ?

(b) Explain briefly the polymerization mechanism. *5+5*

4. (a) State the characteristics of long chain polymers. Describe briefly the deformation behaviour of plastics.

(b) Define monomer and polymer. What do you mean by thermo-mechanical properties ? Explain with the help of suitable examples. *5+5*

5. (a) State some important Non-Destructive Testing (NDT) methods and their fields of application. Also explain their limitations.

(b) Describe in brief the ultrasonic inspection technique. *5+5*

6. (a) Explain the factors affecting the solubility and resistance of polymeric materials.

(b) Why are plasticizers added to polymers ? Explain. *5+5*

7. (a) Distinguish between structure and properties of thermosetting and thermoplastic resins.

(b) Describe the injection moulding process for plastics. How is it different from other thermoplastic forming techniques ? *5+5*

8. A composite material is stressed under isostrain condition. The composite consists of a continuous glass fiber reinforced epoxy resin produced by using 65 percent by volume of E-glass fibers having a modulus of elasticity of E_f = 75 GPa, a tensile strength of 2500 MPa, and a hardened epoxy resin with a modulus of elasticity of E_m = 4 GPa, and a tensile strength of 65 MPa.

Calculate

(a) the modulus of elasticity of the composite material,

(b) the tensile strength of the composite, and

(c) the fraction of the load carried by the fiber. *10*

9. (a) What are the functions and applications of laminated glass ?

(b) A unidirectional Kevlar-49 fiber epoxy composite contains 65 percent by volume of Kevlar-49 and 35 percent epoxy resin. The density of the Kevlar-49 fiber is 1·48 mg/m^3 and that of the epoxy resin is 1·20 mg/m^3.

(i) What are the weight percentages of Kevlar-49 and epoxy resin in the composite materials ?

(ii) What is the average density of the composite material ? *5+5*

10. (a) Describe in brief the constituents of glass. Also list the properties of glass.

(b) Determine the Young's modulus of a composite containing 62% (by volume) of glass fibre (E_f = 72 GN/m^2) in a matrix of epoxy resin (E_m = 3·5 GN/m^2) under isostress condition. *5+5*