No. of Printed Pages : 4

BAS-022

B.Tech. AEROSPACE ENGINEERING (BTAE)

Term-End Examination

00113

June, 2018

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) Why is glass the most used reinforcement for composites ?

(b) Give an example where glass is used as a structural material. Explain why it is safe. *5+5*

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

(b) What are the major preparation methods for most used fibers and what are their main characteristics ? *5+5*

3. (a) A piece of wood containing moisture weighs 193·8 g and after oven drying to a constant weight, weighs 171·9 g. What is its percent moisture content ?

(b) A metal-matrix composite is made with 75 percent by volume of aluminium alloy 2124-T6 and 25 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+5*

4. (a) Differentiate between a polymer and a plastic.

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

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

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

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

(b) Explain chain polymerisation reaction. What is the degree of polymerisation ? A particular type of polyethylene has a molecular mass of 1,40,000 g/mol. What is its degree of polymerisation ? *5+5*

7. (a) Define monomer. What do you mean by thermo mechanical properties ? Explain with the help of suitable examples.

(b) State whether the following statements are true (T) or false (F) : *5+5*

(i) Brinell test is done to assess the hardness of a metal.

(ii) Radiography can be done using X-rays or γ-rays (both).

(iii) Radiography is a cheaper NDT.

(iv) Surface roughness assessment uses a capacitance probe.

(v) Magnetic particle inspection can be done on ferromagnetic materials only.

8. (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 one of the NDT methods for common flaws in casting.

9. Calculate *10*

(a) the modulus of elasticity,

(b) the tensile strength, and

(c) the fraction of the load,

carried by the fiber for the following composite material stressed under isostrain condition. The composite consists of a continuous glass-fiber-reinforced-epoxy resin produced by using 60 percent by volume of E-glass having a modulus of elasticity of E_f = 72 GPa, a tensile strength of 2400 MPa, a hardened epoxy resin with a modulus of E_m = 3 GPa and a tensile strength of 62 MPa.

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

(b) How are ceramics different from other engineering materials like metals and plastics ? *5+5*