B.TECH. IN (AEROSPACE ENGINEERING) (BTAE)

Term-End Examination

December, 2012

BAS-022 : COMPOSITE MATERIALS

Time : 3 hours *Maximum Marks : 70*

Note : *Answer any seven questions. All questions carry equal marks.*

1. (a) What are some of the advantages of glass - fiber - reinforced plastics ? 5+5

   (b) What are the differences in the compositions of E and S glasses ? Which is the strongest and the most Costly ?

2. (a) What processing steps are carried out if a very - high - strength type of carbon fiber is desired ? If a very - high - modulus type of carbon fiber is desired, what processing steps are carried out ? 5+5

   (b) What is an aramid fiber ? What are two types of commercially available aramid fibers ?

3. (a) What type of chemical bonding takes place 5+5
within the aramid fibers ? What type of
chemical bonding takes place between the
aramid fibers ?

(b) What are two of the most important matrix
plastics for fiber - reinforced plastics ? What
are some advantages of each type ?

4. (a) How does the amount and arrangement of 5+5
the glass fibers in fiberglass - reinforced
plastics affect their strength ?

(b) What are the main property contributions
of the carbon fibers in carbon - fiber -
reinforced plastics ?

5. The average density of a carbon - fiber- epoxy   10
composite is 1.615 gm/cm^3. The density of the
epoxy resin is 1.21 gm/cm^3 and that of the carbon
fiber is 1.74 gm/cm^3.

(a) What is the volume percentages of carbon
fibers in the composite ?

(b) What are the weight percentages of epoxy
resin and carbon fibers in the composite ?

6. Calculate the tensile modulus of elasticity for a   10
laminated composite consisting of 62 percent by
volume of unidirectional carbon fibers and an
epoxy matrix under isostress conditions. The
tensile modulus of elasticity of the carbon fibers is
340 GPa and that of the epoxy is 4.50×10^3 MPa.

7. (a) How will you control the crystallinity of 5+5 polymers by polymerization method ?

   (b) Why is certain amount of amorphous material provided in crystalline polymers ?

8. (a) Name one natural fiber - reinforced 5+5 composite and one human - made aggregate composite material. what is the large - scale use of the second one and which acts as the matrix in such aggregate composite ?

   (b) A piece of wood containing moisture weighs 210 gm and after oven drying to a constant weight, it weighs 125 gm. What is its percent moisture content ?

9. (a) Define monomer and polymer. Write typical 5+5 polymeric repeat unit structure for both addition and condensation polymerization. Which of the methods is expected to result in branched structure ?

   (b) A metal - matrix composite is made with 80 percent by volume of aluminium alloy 2124 - T 6 and 20 percent by volume of sic whiskers. The density of the 2124 - T 6 alloy is 2.77 gm/cm^3 and that of the whiskers is 3.10 gm/cm^3. Calculate the average density of the composite material.

10. (a) Give examples of metal - matrix composites, **5+5**
        and identify their advantages over
        polymer- matrix composites.

    (b) Explain in brief the benefits from Non-
        Destructive Testing (NDT). Discuss X-Ray
        NDT.