

**B.Tech. AEROSPACE ENGINEERING
(BTAE)**

Term-End Examination

June, 2017

00314

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) Describe briefly the types and general characteristics of ceramics and glasses.
- (b) Determine Young's modulus of a composite containing 72% volume of glass fibre ($E_f = 72 \text{ GN/m}^2$) in a matrix of epoxy resin ($E = 3 \text{ GN/m}^2$) under isostress condition. 5+5
2. (a) What are ceramic-matrix composites ? Explain briefly.
- (b) List down the applications of ceramics. Also, discuss briefly the properties of ceramic materials. 5+5

3. (a) Fill up the blanks for the following with appropriate words :

- (i) _____ is an amorphous material.
- (ii) At high temperature, the rigidity of ceramics is _____ .
- (iii) Porcelain has _____ positive temperature coefficient.
- (iv) Ferrites are mixed metal oxide _____ .
- (v) Ultrasonic testing is a _____ .

(b) State *True/False* for the following sentences :

- (i) The compressive strength of ceramic materials is several times more than their tensile strength.
- (ii) In ceramic materials, stress concentration has a significant effect on compressive strength.
- (iii) Rutile bodies have large negative coefficients.
- (iv) The silicates are co-ordinate structures based upon large anions arranged about small cations.
- (v) Brinell hardness test is a non-destructive test. 5+5

4. (a) What is 'polymorphism'? Explain briefly.

(b) Explain briefly 'processing of ceramics'. Also, define the Glass Transition Temperature. 5+5

5. (a) Discuss briefly the production of composite structures.
- (b) Explain the reasons for the rising popularity of pure oxide ceramics over traditional refractories. 5+5
6. (a) What processing steps are carried out if,
- (i) a very-high-strength type of carbon fibre is desired ?
- (ii) a very-high-modulus type of carbon fibre is desired ?
- (b) What is an aramid fibre ? What are the two types of commercially available aramid fibres ? 5+5
7. (a) Describe in brief the thermosetting and thermoplastic polymers.
- (b) State some non-destructive testing techniques with their limitations. 5+5
8. (a) How will you control the crystallinity of polymers by polymerization method ?
- (b) An MMC is made with an Al 2024 alloy with 32% volume percent SiC whiskers. If the density of the composite is 3.28 gm/cm^3 and that of the SiC fibre is 3.18 gm/cm^3 , what will the density of the Al 2024 alloy be ? 5+5