

Registration No. :

--	--	--	--	--	--	--	--	--	--

Total number of printed pages – 2

B. Tech  
PEMT 5305

**Sixth Semester Examination – 2013**

**COMPOSITE MATERIALS**

**BRANCH : MME / MM**

**QUESTION CODE : A 230**

**Full Marks – 70**

**Time : 3 Hours**

*Answer Question No. 1 which is compulsory and any **five** from the rest.*

*The figures in the right-hand margin indicate marks.*

1. Answer the following questions : 2×10
- (a) What is wettability ? How is the degree of wettability determined ?
  - (b) What is glass transition temperature ? How is it different from melting temperature ?
  - (c) Explain why the differences in the coefficients of thermal expansion,  $\alpha$ , between the matrix and the reinforcement is more harmful in CMCs than in MMCs.
  - (d) What is the effect of liquid environment on the mechanical performance of Zirconia Toughened Alumina ?
  - (e) What methods are adopted for oxidation protection of carbon-carbon composites ?
  - (f) What is the benefit of polyetheretherketone (PEEK) having high limiting oxygen index, LOI, value of 35% ?
  - (g) What is the role of carbon black in rubber matrix composites ?
  - (h) Among debonding and fibre pull-out which is a more significant toughening mechanism and why ?
  - (i) What is critical fibre length ?



P.T.O.

- (j) A continuous and aligned glass-reinforced composite consists of 40 vol % of glass fibres having a modulus of elasticity of  $69 \times 10^3$  MPa and 60 vol% of a polyester resin that, when hardened, has a modulus of  $3.4 \times 10^3$  MPa. Calculate the modulus of elasticity of this composite.
2. (a) Discuss the advantages and benefits of composites over conventional monolithic materials. 5
- (b) Explain the production process of carbon fibres from different precursors. 5
3. (a) Explain with suitable sketches the different solid state processing methods for producing metal matrix composites. 5
- (b) Explain with suitable sketches the spray co-deposition process of production of SiC particulate reinforced metal. 5
4. Explain with suitable sketches the different types of interfacial bonding between the matrix and the reinforcement in composites. 10
5. (a) Describe the production process of multifilamentary superconducting composite by the bronze route. 5
- (b) Draw and explain the force-displacement curves for a monolithic ceramic, a particulate reinforced CMC and a fibre-reinforced CMC. 5
6. (a) What is glass ceramics ? What are the advantages of glass ceramics over other materials ? 5
- (b) Explain the different processing techniques of ceramic matrix composites involving slurries. 5
7. (a) Explain the production process, properties and major application of porous carbon-carbon composites. 5
- (b) Explain microcrack toughening and transformation toughening. 5
8. (a) Explain with suitable sketches the pultrusion method of producing polymer matrix composites. 5
- (b) Explain with suitable sketches the Resin Transfer Moulding method of producing polymer matrix composites. 5