Sl. No of Question Paper: 2390

Unique paper code: 1141403
Name of Paper: Polymer blends and composites
Name of course: B.Tech (H) Polymer Science
Semester: IV
Duration: 3 hour
Maximum Marks: 75

F-4

Instruction for candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. Attempt five questions in all.
3. Question No.1 is compulsory.
4. Use of calculator is allowed and log table may be provided.

Q.1

(a) List three functions of the matrix phase in composites.
(b) What is miscibility gap? On what factors it will depend?
(c) Explain structural composites.
(d) Define Polymer Alloy and Interpenetrating polymer network (IPN).
(e) Why twin screw extruder are preferable for blending compared to single screw extruder?
(f) What are the isotropic and anisotropic composites? Give example.
(g) Give example of following blends
    (i) amorphous/amporphous,
    (ii) amorphous/crystalline
    (iii) crystalline/crystalline
(h) Define microrheological quantities of polymer blend system?
(i) Describe the process to improve the impact toughness of PP. **(3X9=27)**

Q.2

Continuous and aligned fiber-reinforced composite having a cross-sectional area of $1130mm^2$ is subjected to an external tensile load. If the stresses sustained by the fiber and matrix phase are 156MPa and 2.75MPa respectively, the force sustained by the fiber-phase is 74000N and the total longitudinal strain is $1.25X10^{-3}$, determine

(a) The force sustained by the matrix phase
(b) The modulus of elasticity of the composite materials in the longitudinal direction.
(c) The moduli of elasticity for the fiber and matrix phases. **(5,4,3=12)**

Q. 3

(a) Explain the term "hybrid composite" with examples. List the advantages and disadvantages of hybrid composites.
(b) Write an expression for the modulus of elasticity for a hybrid composite in which all fibers of both types are oriented in the same direction.
(c) Discuss the DMA method to illustrate miscibility of polymer A and B. **(5,4,3=12)**

Q. 4

(a) Describe compatibilization methods of blends. Also discuss the advantages and limitation of each method?
(b) For some glass fiber-epoxy matrix combination, the critical fiber length-fiber diameter ratio is 50. Determine the fiber-matrix bond strength if specific strength and specific gravity of fibers are 1.34 GPa and 2.58 respectively.
(c) Discuss the advantages of blending of polymers.

(5,4,3=12)

Q. 5

(a) Explain the process of manufacturing of sandwitch panels.
(b) Discuss the factors affecting the strength and stiffness of composites.
(c) Illustrate staining method to recognize the compatibility of blends.

(5,4,3=12)

Q.6 Write a short note on (Any Three) **(4X3=12)**
(a) Thermoplastic elastomer (TPE) blend
(b) Pultrusion

(d) Fiber placement
(e) Spectroscopic method for miscibility