B. Tech.
(SEM. VIII) EXAMINATION, 2006-07
POLYMER COMPOSITES

Time : 3 Hours] [Total Marks : 100

Note : (1) Attempt all questions
(2) All questions carry equal marks.

1 Answer any four parts of the following: 4×5

(a) What are unsaturated polyester resins? Mention the type of such resins used in the composite industry for specific purposes.

(b) When epoxy resins are preferred over unsaturated polyester resins in the composite manufacture? Briefly mention the type of epoxy resins and their usual curing agents.

(c) Compare the properties of reinforced plastics with other constructional materials. Give advantages and limitations of polymeric composites.

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(d) Describe in brief the glass compositions which are suitable for fibre drawing operations. Mention the typical characteristics of glass fibres due to which it becomes a common reinforcing agent in composites.

(e) What are boron filaments? Why these fibers are preferred over glass fiber in high performance composites.

2 Answer any two parts of the following: 2x10

(a) Briefly mention the advantages of fibrous reinforcement and derive an expression relating the composite strength to volume percent reinforcement. Mention the assumptions with justification.

(b) Discuss the influence of resin characteristics and resin-reinforcement, interaction on composite strength.

Derive an expression relating strain in the resin to the filament spacing.

(c) Give details of the forms of glass fibers available to a composite fabricator. Why glass fiber requires surface treatment before being used in the manufacture of a high strength composite?

3 Answer any two parts of the following: 2x10

(a) Define carbon and graphite fibers. Name the common precursors used in their manufacture. Starting from pitch, how carbon fibers are manufactured? Give salient features of carbon fibers.

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(b) Discuss the characteristics of the polymer from which aramid fibers are manufactured. Enumerate the salient properties and the forms of each fibers available in the market.

(c) Compare the hand lay up and spray-up techniques for the manufacture of composites. Briefly describe the type of moulds and the design considerations.

4 Attempt any two parts of the following:  

(a) Define the common reinforced moulding compounds and differentiate between them. Give their typical properties and applications.

(b) How the following problems can be controlled if arised in the parts made using the moulding compounds?
   (i) Blisters
   (ii) Incomplete part
   (iii) Internal cracks
   (iv) Surface porosity
   (v) Sticking to the mold.

(c) How the composite structural profiles are manufactured on continuous basis? Briefly describe the advantages and limitations of the process including the common resin/reinforcement requirements.
5 Write short notes on any four of the following: 4×5

(i) Filament winding

(ii) Nano-Composites

(iii) Metal-matrix composites.

(iv) Bag molding technique

(v) Joining and machining techniques

(vi) Use of composite in agriculture sector.

(vii) Thermo plastic composites

(viii) High silica and quartz fibers.