USN | | | | | | | | | | 10AE52

Fifth Semester B.E. Degree Examination, Dec.2014/Jan.2015

Introduction to Composite Materials

Time: 3 hrs. Max. Marks:100

Note: ***Answer FIVE full questions, selecting at least TWO questions from each part.***

PART – A

1 a. Define composite materials. Classify them in detail. (05 Marks)
b. List the desirable characteristics of fiber reinforced composites (FRCs). (05 Marks)
c. Sketch the possible fiber assignments and list the different fibers used in composites. (10 Marks)

2 a. Sketch and explain the different stages of hand lay-up process to fabricate composites. (10 Marks)
b. Explain with sketch the pressure bag moulding process of making polymer matrix composites. (10 Marks)

3 a. With a neat sketch, explain the working principle of filament winding process. (10 Marks)
b. Sketch and explain the pultrusion process to fabricate FRP composites. (10 Marks)

4 a. Explain laser beam cutting of composite materials. (10 Marks)
b. List the joining methods for PMC's. Explain any one of them. (10 Marks)

PART – B

5 a. Explain different types of failure theories of an orthotropic lamina. (10 Marks)
b. Obtain the relationships for stress-strain in terms of compliance for an orthotropic lamina. (10 Marks)

6 a. Define the term rule of mixture and obtain the relationship for
i) Density ii) Mass fraction of composite using (R O M). (10 Marks)
b. A glass/epoxy lamina consists of a 75% fiber volume fraction. Assume the density of fiber and matrix are $\rho_f = 2550$ kg/m^3 and $\rho_m = 1250$ kg/m^3 respectively. Determine the i) Density of composite ; ii) Mass fractions of glass and epoxy ; iii) Volume of composite lamina, if the mass of the lamina is 5 kg, iv) Volume and mass of fibre and epoxy. (10 Marks)

7 a. Explain the basic assumptions in classical laminated plate theory. (10 Marks)
b. Derive the expressions for [A], [B] and [D] matrices for a laminate using fundamentals. (10 Marks)

8 a. List and explain the characteristics of reinforcement materials used in MMCs. (10 Marks)
b. List the various applications of MMCs. (05 Marks)
c. What are the factors to be considered in the selection of base metals for MMCs? (05 Marks)

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Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.