Fifth Semester B.E. Degree Examination, Dec.2013/Jan.2014
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 a composite material. Give its classification with suitable examples. **(06 Marks)**
   b. List the advantages, and limitation of composite materials. **(08 Marks)**
   c. Distinguish between thermo plastic and thermo set polymers. **(06 Marks)**

2 a. Explain the following fibre reinforced plastic fabrication methods:
      i) Spray up moulding;   ii) Vacuum bag moulding technique. **(16 Marks)**
   b. Give the advantages of hand lay up process. **(04 Marks)**

3 a. With neat sketches, explain the following processes:
      i) Pultrusion;   ii) Blow moulding. **(16 Marks)**
   b. Explain the applications of composites in automobile application. **(04 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. Obtain the stress-strain relation for plane stress in 2D orthotropic material. **(12 Marks)**
   b. Show that $\overline{\Delta} = 1 - \gamma_{12}\gamma_{21} - \gamma_{23}\gamma_{32} - \gamma_{31}\gamma_{13} - 2\gamma_{21}\gamma_{32}\gamma_{13} > 0$ for orthotropic material correctly reduce to $r < 1/2$ for isotropic materials. **(08 Marks)**

6 a. Derive an expression for Young's modulus of a composite in terms of volume fraction of matrix fibre and elastic module of matrix and fibre under iso-strain conditions. **(10 Marks)**
   b. For the laminar shown find the stresses in 1-2 direction and the strains in x-y direction. The laminar has the following properties: $E_1 = 14$ GN/m^2, $E_2 = 35$ GN/m^2, $G_{12} = 42$ GN/m^2, $\gamma_{12} = 0.4$, $\gamma_{21} = 0.1$, $\sigma_x = -3.5$ MN/m^2, $\sigma_v = 7$ MN/m^2, $\tau_{xy} = -1.4$ MN/m^2. **(10 Marks)**

Fig.Q.6(b)
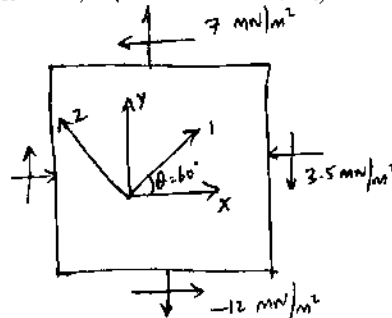
7 a. List the failure theories for an orthotropic lamina. Explain any two in detail. **(10 Marks)**
   b. Obtain an expression in terms of stress and strain variation in a laminate for a classical plate theory. **(10 Marks)**

8 a. List the advantages, limitations and applications of metal matrix composites. **(12 Marks)**
   b. Write and explain in brief the types of matrix and reinforcement materials of metal matrix composites. **(08 Marks)**

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