CBCS SCHEME

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15AE52

Fifth Semester B.E. Degree Examination, Feb./Mar. 2022
Introduction to Composite Materials

Time: 3 hrs.   Max. Marks: 80

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. Define Composite Material. Classify them in detail.   (08 Marks)
   b. List the advantages, limitations and applications of composite materials. (08 Marks)

OR

2 a. Sketch and explain the different stages of Hand lay-up process to fabricate composites. (08 Marks)
   b. Sketch and explain the solid state processing of MMC.   (08 Marks)

Module-2

3 a. Sketch and explain the fibers orientation in composites.   (08 Marks)
   b. What is Bag moulding process? Explain any one.   (08 Marks)

OR

4 a. Sketch and explain the Filament winding process to fabricate ERP composites. (08 Marks)
   b. Explain laser beam cutting of composite materials.   (08 Marks)

Module-3

5 a. Define ROM. Derive the longitudinal Young's modulus by SOM approach. (08 Marks)
   b. A Glass/Epoxy lamina consists of a 70% fiber volume fraction. Use the properties of glass and epoxy respectively to determine the
      i)   Density of lamina
      ii) Mass fractions of glass and epoxy
      iii) Volume of composite lamina, if mass of lamina is 4kg
      iv) Volume and mass of glass and epoxy [Take $\rho_f = 2500 kg/m^3$ and $\rho_m = 1200 kg/m^3$). (08 Marks)

OR

6 a. Obtain the stress-strain relation for plane stress in 2-D orthotropic material. (08 Marks)
   b. Find the compliance and stiffness matrix for a graphite/epoxy lamina, the materials properties are given as,
      $E_1 = 181 GPa$, $E_2 = 10.3 GPa$, $E_3 = 10.3 GPa$, $\gamma_{12} = 0.28$, $\gamma_{23} = 0.60$, $\gamma_{13} = 0.27$, $G_{12} = 7.17 GPa$, $G_{23} = 3.0 GPa$ and $G_{31} = 7.00 GPa$. (08 Marks)

Module-4

7 a. State and explain: i) Tsai-Hill   ii) Max stress.   (08 Marks)
   b. Explain the basic assumptions in classical laminated plate theory.   (08 Marks)

OR

8   a. Obtain an expression for resultant laminate forces and moments.   (08 Marks)
    b. Derive the expression for [A], [B] and [D] matrices for a laminate using fundamentals.   (08 Marks)

Module-5

9   a. Differentiate destructive and Non-destructive testing of composite materials.   (08 Marks)
    b. Explain the ultrasonic testing of composites.   (08 Marks)

OR

10   Mention the applications of composites in:
     i)   Missiles
     ii)   Aircrafts
     iii)   Marine
     iv)   Future potential of composites.   (16 Marks)

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