

50033



- b) A graphite/epoxy cuboid specimen with voids has dimensions of $a \times b \times c$ and its mass is M_c . After it is put into a mixture of sulfuric acid and hydrogen peroxide, the remaining graphite fibers have a mass M_f . From independent tests, the densities of graphite and epoxy are ρ_f and ρ_m , respectively. Determine the volume fraction of the voids in terms of $a, b, c, M_f, M_c, \rho_f$ and ρ_m . (16)
12. a) Show the reduction of an isotropic material stress-strain equations to those of monoclinic material stress-strain equations. (16)
- (OR)
- b) i) Determine the compliance and stiffness matrix for a graphite/epoxy lamina. The material properties are given as follows :
 $E_1 = 181 \text{ GPa}, E_2 = 10.3 \text{ GPa}, E_3 = 10.3 \text{ GPa}, \nu_{12} = 0.28, \nu_{23} = 0.60,$
 $\nu_{13} = 0.27, G_{12} = 7.17 \text{ GPa}, G_{23} = 7.17 \text{ GPa}, G_{31} = 7.17 \text{ GPa}.$ (8)
- ii) Determine the engineering constants of a 60° graphite/epoxy lamina. Use the properties of a unidirectional graphite/epoxy lamina as follows : (8)
 $E_1 = 181 \text{ GPa}, E_2 = 10.3 \text{ GPa}, \nu_{12} = 0.28, G_{12} = 7.17 \text{ GPa}.$
13. a) A $[0/30/-45]$ graphite/epoxy laminate is subjected to a load of $N_x = N_y = 1000 \text{ N/m}$. Using the properties of unidirectional graphite/epoxy ($E_1 = 181 \text{ GPa}, E_2 = 10.3 \text{ GPa}, \nu_{12} = 0.28, G_{12} = 7.17 \text{ GPa}$) and assuming that each lamina is 5 mm thick, find
 1) Midplane strains and curvatures.
 2) Global and local stresses on top surface of 30° ply. (16)
- (OR)
- b) Derive the strain - displacement equations for a plate under in-plane loads such as shear and axial forces and bending and twisting moments using classical lamination theory. (16)
14. a) Explain the various methods of glass fiber manufacturing processes with neat sketches. (16)
- (OR)
- b) Enumerate in detail about the typical production autoclave with a schematic diagram. What is the principle of autoclave curing process ? (16)
15. a) What are the basic design concepts used for the construction of sandwich structures ? Summarize it with neat sketches. (16)
- (OR)
- b) i) Write a short note on the fabrication methods for Honeycomb core. (8)
- ii) Explain briefly about the honeycomb processing prior to the adhesive bonding process. (8)