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Question Paper Code : X10040

B.E./B.Tech. DEGREE EXAMINATIONS, APRIL/MAY 2021
Sixth Semester
Aeronautical Engineering
AE8603 – COMPOSITE MATERIALS AND STRUCTURES
(Regulations 2017)

Time : Three Hours | Maximum : 100 Marks

Answer ALL questions

PART – A **(10×2=20 Marks)**

1. Define mass fraction.
2. Express the density ρ_c of a composite material in terms of constituent material densities and volume fractions.
3. State Hooke's law.
4. Define macromechanics.
5. What are composite materials and its classification ?
6. What are the different types and uses of laminates ?
7. Define fiber and matrix.
8. Summarize the production of glass fibers and name the raw materials used.
9. Consider two facesheets each of thickness t/2 separated by honeycomb core of height h. Approximately how many times will the transverse stiffness, strength and panel weight increase if the core height h is increased 3 times, facesheet thickness being the same ?
10. What are the core parameters in sandwich type construction which control structural efficiency ?

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PART – B **(5×13=65 Marks)**

11. a) Explain the advantages and applications of composite materials in aircraft industry. **(13)**

(OR)

b) Explain fiber volume fraction in composites and describe the effects of voids on the strength of composite laminates. **(13)**

12. a) Derive the stress strain relation for Isotropic material from anisotropic material. **(13)**

(OR)

b) Derive E_1, E_2, G_{12} and Poisson's ratio using mechanics of materials approach. **(13)**

13. a) Derive the governing differential equation for laminate from Kirchhoff's hypothesis. **(13)**

(OR)

b) Explain the stress strain relations for a composite laminate and discuss about their failure theories. **(13)**

14. a) Explain the various open and closed moulding process associated with the fabrication of composite laminates. **(13)**

(OR)

b) Describe the importance of repair of composite materials and explain the different types of repair techniques used in composites. **(13)**

15. a) Describe the design concepts of sandwich construction and discuss about the materials used for sandwich construction. **(13)**

(OR)

b) Explain the failure modes of sandwich panels and describe the bending stress and shear flow in composite panels. **(13)**

PART – C **(1×15=15 Marks)**

16. a) Classify composite materials based on reinforcement and matrix used and describe its advantages and disadvantages. **(15)**

(OR)

b) Derive the A, B, D matrix for a composite laminate and write its significance. **(15)**