

Fifth Semester B.Tech Degree Examination, Nov/Dec 2015

(2013 scheme)

Branch: Aeronautical Engineering

13.506.1: COMPOSITE MATERIALS

Time: 3 Hours Max. Marks: 100

Instructions: 1) Answer all questions from Part – A and three full questions from Part – B.

2) Choosing not more than one question from each Module from Part – B.

PART-A

1. How do we classify composite materials?
2. What are the two main constituents of composite materials? Explain with example.
3. Explain autoclave moulding with neat sketch.
4. Write down the steps involved in fabrication of short fibre composites.
5. Distinguish between open mould and closed mould process.
6. What you mean by X-ray radiography.
7. Explain the features of cross ply laminates.
8. Write short notes on recent trends in composite materials.
9. What you mean by bucky paper?
10. Define generalized Hooke's law. (10X2=20)

PART-B

MODULE-I

11. a) Explain the classification of composite materials. (20)

(or)

- b) i. What is fibre and flakes? List out the types of fibres and explain any three. (16)

- ii. List any five nomenclatures used in composite materials (04)

MODULE-II

12. a). Explain i) Filament winding process (05)
- ii) Vacuum bag moulding process (05)
- iii) Resin transfer moulding process (05)

iv) Hand layup process (05)

(or)

b) .Explain i) Spray lay-up process (05)

ii) Autoclave moulding process (05)

iii) Enumerate the fabrication method of metal matrix and ceramic matrix composites. (10)

MODULE-III

13.a). i) Explain any two experimental characterizations of composites. (16)ii)

Find the ultimate tensile strength of glass-epoxy lamina with 70% fibre volume fraction. Also find critical fibre volume fraction. $E_f=85\text{Gpa}$, $E_m=3.4\text{Gpa}$, $(\sigma_f)_{ult}=1550\text{Mpa}$, $(\sigma_m)_{ult}=72\text{Mpa}$. (04)

(or)

b). i) Find the longitudinal compressive strength of graphite/epoxy lamina with 60% fibre volume fraction. Assume fibres are circular and are in square array.

$E_f = 230\text{Gpa}$, $\gamma_f = 0.30$, $(\sigma_f^T)_{ult} = 1999\text{Mpa}$, $(\tau_f)_{ult} = 36\text{Mpa}$, $E_m = 3.4\text{Gpa}$, $\gamma_m = 0.3$, $(\sigma_m^T) = 72\text{Mpa}$, $(\tau_m)_{ult} = 34\text{Mpa}$ (15)

ii) Explain ultrasonic testing method. (05)

ii) Discuss about condition monitoring of the engine on ground and at altitude. (6)

MODULE-IV

14. a) i) Explain any four mechanical behavior of uni-directional composites. (15)

ii) Explain angle-ply laminates. (05)

(OR)

b) i) Explain the application of composite materials in aerospace, automotive, defense and industry. (20)

(4X20=80)