Register No: ……

B.E. DEGREE EXAMINATIONS: NOV / DEC 2010

Seventh Semester

AERONAUTICAL ENGINEERING

U07AR702: Composite Materials & Structures

Time: Three hours **Maximum Marks: 100**

Answer ALL Questions

PART A (10x1= 10 Marks)

1. Flexibility is defined as the inverse of --------- stiffness.

(a) Moment (b) shear (c) bending (d) axial

2. Most common shape of fibre used is

(a) Rectangular (b) square (c) circular (d) triangular

3. A lamina is a thin layer of a composite material that is generally of a thickness order of

(a) 2mm (b) 1.25 mm (c) 0.125 mm (d) 0.2mm

4. The macro mechanical analysis of a lamina is based on ------ properties.

(a) Average (b) Maximum (c) Minimum (d) Central

5. A cross-ply laminate also called laminates with specially --------- layers

(a) Symmetric (b) orthotropic (c) quasi (d) balanced

6. A laminate is called an angle ply laminate if it has plies of the same material and thickness and only oriented at

(a) $+\theta$ (b) $-\theta$ (c) $\pm\theta$ (d)None of these

7. Sandwich panels consist of thin facings also called

(a) skin (b) lap (c) cover (d) all of these

8. Increasing the thickness by adding a core in the middle increases

(a) strength (b) stiffness (c) resistance (d) bending

9. The function of resin is to

(a) separate (b) attract (c) bind (d) collect

10. The resin frequently used at room temperature is

(a) carbon (b) fibre (c) glass (d)epoxy

PART B (10 x 2 = 20 Marks)

11. What is a composite?

12. What are advanced composites?

13. Explain difference between fibres and whiskers.

14. What is an anisotropic and orthotropic material?

15. What is a laminate?
16. Define symmetric laminates?
17. Explain sandwich construction? Give example for face and core.
18. Explain the function and desirable properties of resins used in FRP?
19. What are the assumptions made in netting analysis?
20. What is difference between open mould and closed mould process?

PART C (5 x 14 = 70 Marks)

21. a) How composites are classified? What are prepregs?

(OR)

b) Compare the properties of metals, ceramics and polymers as matrix materials.

22. a) Determine E_1 & E_2 for lamina using macro - mechanics where 1 and 2 are arbitrary axis.

(OR)

b) A displacement field in a body is given by $u = 10–5(x2 + 6y + 7xy)$, $v = 10–5(yz)$, $w = 10–5(xy + yz2)$. Find the state of strain at $(x, y, z) = (1, 2, 3)$

23. a) For the following laminate compute the stiffness matrices No. of layers 4, each layer is 1mm thick 0/-45/45/90. E_1=40 Gpa, E_2=8 Gpa, G_{12}= 4Gpa ν_{12}= 0.25.

(OR)

b) A composite laminate has 3 layers with fibre orientation 0 / 90 / 0. Top layer an bottom layer thickness is 2mm (each and middle layer thickness is 3 mm. Given N_x = 50 N/m, N_y = 200 N/m N_{xy} = 300 N/m M_x = 1000N, M_y=1000 N & M_{xy} = 500N compute the strain and curvature. E_1 = 180 Gpa, E_2 = 15 Gpa, G_{12} = 7 Gpa, ν_{12} = 0.28.

24. a) Explain briefly the failure modes of sandwich panels.

(OR)

b) Explain briefly impact, fracture and fatigue resistances of composites.

25. a) Describe any two methods for production of fibers.

(OR)

b) Explain any two methods, one under open mould process and one under closed mould process.

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