



B.E DEGREE EXAMINATIONS: MAY 2015

(Regulation 2009)

Seventh Semester

AERONAUTICAL ENGINEERING

AER118: Composite Materials And Structures

Time: Three Hours

Maximum Marks: 100

Answer all the Questions:-

PART A (10 x 1 = 10 Marks)

- _____composites consist of particles immersed in matrices such as alloys and ceramics
 - Particulate
 - Flake
 - Fiber
 - Nano
- The elastic constants for orthotropic material is
 - 21
 - 12
 - 9
 - 2
- Which of the following factor(s) affecting fiber performance in the composites
 - Orientation
 - Length
 - Shape
 - All the above
- A cross-ply laminate is also called as laminates with specially _____layers
 - Symmetric
 - orthotropic
 - circular
 - balanced
- If Strength Ratio >1 , then the lamina is
 - safe
 - unsafe
 - failed
 - All the above
- The ratio between the strength and the density of the material is defined as
 - Specific modulus
 - Specific strength
 - Young's modulus
 - Specific gravity
- _____is a single flat layer of unidirectional fibers or woven fibers arranged in a matrix.
 - lamina
 - laminate
 - hybrid laminate
 - Both a and b
- S-type glass fiber is generally referred to as
 - Magnesia alumino silicate glass
 - Magnesium glass

$$\begin{aligned} \nu_{12} &= 0.28 & \nu_{23} &= 0.60 & \nu_{13} &= 0.27 \\ G_{12} &= 7.17 \text{ GPa} & G_{23} &= 3.0 \text{ GPa} & G_{31} &= 7.00 \text{ GPa} \end{aligned}$$

- ii) For glass epoxy laminate $E_f = 85 \text{ GPa}$, $E_m = 3.4 \text{ GPa}$, $\nu_m = 0.3$ and $\nu_f = 0.25$, find (7)
the minor Poisson's ratio ν_{21} and G_{12} for a fiber volume fraction of 70%.

23. a) i) Find the Extensional stiffness matrix [A] and Coupling stiffness matrix [B] for a (10)
three ply $[0^\circ/30^\circ/-45^\circ]$ graphite epoxy laminate. Assume each lamina has a
thickness of 5mm. The properties of graphite/epoxy are $E_1=181\text{GPa}$,
 $E_2=10.3\text{GPa}$, $\nu_{12}=0.28$ and $G_{12}=7.17\text{GPa}$.

- ii) Assume that one is applying a load of $\sigma_x = 2 \text{ MPa}$, $\sigma_y = -3 \text{ MPa}$ and $\tau_{xy} = 4 \text{ MPa}$ (4)
to a 60° angle lamina of graphite/epoxy. Find the strength ratio using the
maximum stress failure theory.

(OR)

- b) What are the assumptions made in lamination theory? Derive the governing
differential equation for unidirectional plane anisotropic plate and reduce to
orthotropic plate.

24. a) i) Explain in detail about basic design concepts of sandwich construction (10)

- ii) What are the materials used for sandwich construction (4)

(OR)

- b) Explain in detail the failure modes of sandwich panels with neat sketches

25. a) Explain in detail about the manufacturing of carbon fibers and glass fibers with
neat sketches

(OR)

- b) List down the assumptions involved in the netting analysis. Obtain the winding
angle for a cylinder subjected to internal pressure.
