Register Number: ……..

B.E DEGREE EXAMINATIONS: APRIL/MAY 2014

(Regulation 2009)

Seventh Semester

AERONAUTICAL ENGINEERING

AER118: Composite Materials & Structures

Time: Three Hours **Maximum Marks: 100**

Answer all the Questions:-

PART A (10 x 1 = 10 Marks)

1. Carbon-Carbon matrix composites retain much of their strength up to
   a) 500°C b) 1500°C
   c) 2500°C d) 1000°C
2. Aspect ratio of fiber is
   a) Length to diameter ratio b) Length to breadth ratio
   c) Length to cross sectional area ratio d) Length to circumference ratio
3. The micro mechanical analysis approach of a lamina is based on_____ properties
   a) Average b) Maximum
   c) Minimum d) Central
4. A laminate is called as **angle- ply** laminate if it has plies of the same material and thickness and only oriented at
   a) +θ b) -θ
   c) ±θ d) None of these
5. The function of resin is to
   a) Separate b) Melt
   c) Bind d) Dissolve
6. Mass Density of a Ply composite is defined as
   a) ρf Vf+ ρmVm b) ρf Vf- ρmVm
   c) ρf*Vf* ρm*Vm d) (ρf Vf) /(ρmVm)
7. Laminate with these matrix elements $A_{16} = A_{26} = B_{16}=B_{26}=D_{16}=D_{26}= 0$ is called
   a) Angle- ply b) Fibre
   c) Glass d) Epoxy
8. Laminate with [B]= 0 is called as
   a) Angle ply b) Cross ply
   c) Symmetric d) Balanced

9. If SR>1,then the lamina is
   a) Safe b) Unsafe
   c) Failed d) None of these
10. Sandwich panels consist of
   a) Face material b) Core material
   c) Both face and core material d) None of these

PART B (10 x 2 = 20 Marks)

11. State the merits and demerits of Tsai Hill failure theory.
12. Distinguish between cross-ply laminate and angle-ply laminate.
13. State the assumptions made in classical **small deformation** theory for a laminate.
14. Define the term: Balanced laminate.
15. State the **maximum-strain** failure theory.
16. State the **maximum stress** failure theory.
17. Define Strength Ratio.
18. List the advantages using a sandwich construction.
19. What is meant by flexral modulus?
20. Explain pre-preg.

PART C (5 x 14 = 70 Marks)

21. a) Derive Hooke's law for a three dimension unidirectional lamina?

(OR)

b) Discuss how the structural composites are classified? State the advantages of composites over conventional metal structures as used in aerospace vehicles.

22. a) For glass-epoxy laminate E_f =85 GPa, E_m = 3.4 GPa, υ_m =0.3 and υ_f= 0.25, find the minor Poisson's ratio υ21 and G12 for a fiber volume fraction of 70%

(OR)

b) Briefly explain the experimental method of characterization of lamina?

23. a) Derive the governing differential equation for a laminated unidirectional anisotropic plate

(OR)

b) Explain the MOM approach to find the four elastic constants?

24. a) Derive the expression for stress- strain relation of orthotropic materials with respect to natural axis?

(OR)

b) Identify the types of laminates given below. Mention which elements of [A],[B] and [D] are zero for each of them.

1. [±45 / ± 45]
2. [30 / -45 / -30 / 45]
3. [0 / 90 / 0 / 90]
4. [30 / 60 / 60 / 30].

25. a) Discuss on the use of structural composites and Advanced Carbon-Carbon fiber composites used in the production of aircraft/(or Space launch- vehicle). Draw a neat sketch of an airplane/(or launch vehicle) showing the application zones where composites are used in a typical modern commercial airliner/(Inter-planetary space –vehicle).

(OR)

b) Explain the process of polymer composite manufacture with examples.

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