KUMARAGURU
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B.E DEGREE EXAMINATIONS: APRIL /MAY 2024

(Regulation 2018)

Seventh Semester

AERONAUTICAL ENGINEERING

U18AEE0007: Composite Materials and Structures

COURSE OUTCOMES

CO1: Identify the properties of fiber and matrix materials used in commercial composite materials.

CO2: Determine the material properties of composites.

CO3: Apply the conventional failure theories to composite materials.

CO4: Design a laminate for a given load condition.

CO5: Identify the most appropriate manufacturing process for fabricating composite components based on its requirement.

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

Answer all the Questions:-

PART A (10 x 2 = 20 Marks)

(Answer not more than 40 words)

1.	Why epoxy resin is used in aerospace industry?	CO1	[K_1]
2.	What is an anisotropic and orthotropic material?	CO1	[K_2]
3.	List out any four assumptions for mechanics of materials approach?	CO2	[K_2]
4.	Determine the transverse Young's modulus of a glass/epoxy lamina with a 70% fiber volume fraction. Ef = 85 GPa; Em = 3.4GPa.	CO2	[K_3]
5.	List down the advantages using a sandwich construction.	CO3	[K_2]
6.	What are the assumptions made in the classical laminate theory?	CO3	[K_2]
7.	Classify the types of honeycomb used for sandwich construction?	CO4	[K_2]
8.	Write the strain displacement equation for the composite laminate?	CO4	[K_1]
9.	State the importance of netting analysis.	CO5	[K_1]
10.	Distinguish between open mould and closed mould process?	CO5	[K_2]

Answer any FIVE Questions:-

PART B (5 x 16 = 80 Marks)

(Answer not more than 400 words)

11.	a)	Briefly explain the advantages, Limitation, and application of composite materials.	16	CO1	[K_2]
12.	a)	Explain the manufacturing process of carbon & glass fibers with neat sketches.	16	CO5	[K_2]

13. a) Find the following for a 60° angle lamina of graphite/epoxy. Use the properties of unidirectional graphite/epoxy lamina from E_1=181 GPa; E_2=10.3 GPa; V_{12}=0.28; G_{12}=7.17 GPa.   16   CO2   [K4]

(i)Transformed reduced stiffness matrix

(ii)Transformed reduced compliance matrix

14. a) A 30° unidirectional composite lamina is subjected to stresses σ_x = 50 MPa, σ_y = -25 MPa , τ_{xy} = 50 MPa. It has the allowable tensile stress of 750 MPa in the fiber direction and 50 MPa in the fiber transverse direction and the allowable compressive stress of 400 MPa in the fiber direction and 100 MPa in the fiber transverse direction. The allowable shear stress is 50 MPa. Determine whether, the lamina will fail under the applied stresses using the maximum-stress theory.   16   CO4   [K4]

15. a) Derive the expression of [A], [B] & [D] matrices for the composite materials.   16   CO3   [K3]

16. a) Briefly explain the Manufacturing method of fibres and environment effect of on composites.   16   CO5   [K3]

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