Register Number:……..

KUMARAGURU
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B.E/B.TECH DEGREE EXAMINATIONS: NOV/DEC 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.	Write the advantages of composite materials?	CO1	[K_1]
2.	What are the functions of matrix materials?	CO1	[K_1]
3.	What is volume fraction? Give the equations.	CO2	[K_1]
4.	What is meant by elasticity approach?	CO2	[K_1]
5.	Give the assumptions of classical lamination theory?	CO3	[K_1]
6.	Name the various failure theories used for composite analysis.	CO3	[K_1]
7.	Give the examples of core material used in sandwich construction.	CO4	[K_2]
8.	What are the failure modes of sandwich panels?	CO4	[K_1]
9.	What is meant by autoclave method?	CO5	[K_1]
10.	Name the open & closed mold process.	CO5	[K_1]

Answer any FIVE Questions:-
PART B (5 x 16 = 80 Marks)
(Answer not more than 400 words)

11.	Derive the elastic constants for orthotropic material starting from generalized Hooke's law.	16	CO1	[K_2]

12.		Determine modulus of elasticity, Poisson's ratio and rigidity modulus for lamina by mechanics of material approach with suitable plot.	16	CO2	[K_2]
13.		A graphite epoxy lamina has the dimensions 2.54 cm X 2.54 cm X 0.3 cm. the specimen weighs 2.98 g. From a resin digestion test, it is found that the graphite fibers alone weigh 1.863 g. the densities of the fiber and matrix are 1.9 g/cm^3 and 1.2 g/cm^3 respectively. The mechanical properties of fiber and resin are E_{f1} = 220 GPa, E_{f2} = 13.79 GPa and E_m = 3.45 GPa. Determine, a) Volume fraction of the fiber material b) Volume fraction of the epoxy matrix c) Volume fraction of voids in the specimen d) Longitudinal moduli of the composite e) Transverse moduli of the composite	16	CO2	[K_3]
14.		Derive the governing differential equations for anisotropic plate to orthotropic plate and isotropic plate.	16	CO3	[K_2]
15.	a)	Obtain flexural rigidity (EI) for sandwich beam with different face thickness of same material.	8	CO4	[K_2]
	b)	Obtain flexural rigidity (EI) for sandwich beam with different face thickness with different face material.	8	CO4	[K_2]
16.		Explain spray-up process of composite manufacturing and mention its advantages and limitations.	16	CO5	[K_2]

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