Hall Ticket Number:

Code No. : 18522 A

VASAVI COLLEGE OF ENGINEERING *(AUTONOMOUS)*, HYDERABAD

Accredited by NAAC with A++ Grade

B.E. (Mech. Engg.) VIII-Semester Main & Backlog Examinations, June-2022

Composite Materials (PE-VI)

Time: **3 hours** Max. Marks: **60**

*Note: Answer all questions from **Part-A** and any **FIVE** from **Part-B***

Part-A (10 × 2 = 20 Marks)

Q. No.	Stem of the question	M	L	CO	PO
1.	List various functions that a matrix phase performs in a composite material.	2	1	1	1
2.	Schematically show the stress-strain curve for an aligned fiber-reinforced composite that is exposed to uniaxial stress applied in the direction of alignment. Superimpose the curves for fiber and matrix materials in the same plot.	2	2	1	2
3.	Write the choice of material(s) and the processing method for the given application. And state the criteria considered for the selection. 	2	5	2	2
4.	What are the advantages of epoxy resins?	2	1	2	1
5.	state the transport properties of composite material.	2	2	3	1
6.	Explain the heterogeneity involved in composite materials.	2	2	3	1
7.	Give the classification of laminar composites.	2	2	4	3
8.	What is the difference between angle-ply laminates and cross-ply laminates?	2	4	4	2
9.	List out the optimizing factors to the design of a laminated composite.	2	2	5	3
10.	Discuss the First ply failure in laminated composites	2	1	5	3
	Part-B (5 × 8 = 40 Marks)				
11. a)	Differentiate in all respects between matrix and reinforcement components in composites.	4	4	1	1
b)	What are the advantages of thermosets over thermoplastics?	4	1	1	1

Contd... 2

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12. a)	Derive the expression for the modulus of elasticity E_1 of a continuous and aligned fiber-reinforced composite in the longitudinal direction.	5	6	2	2
b)	Given an epoxy/carbon unidirectional continuous fiber with a volume fraction of fiber is 0.60 and following are materials properties. Calculate the longitudinal stiffness of the composite.	3	4	2	2
13. a)	Give the Halpin-Tsai equation and discuss the parameters in the equation.	4	6	3	3
b)	What is the anisotropic and orthotropic behavior of composite material?	4	1	3	3
14. a)	Describe the analysis of laminar properties.	3	1	4	1
b)	How do you think the stress strain curves of a laminated composites with 0^0,$0^0/90^0$,$0^0/+45^0/90^0/-45^0$ would be? Explain why?	5	4	4	2
15. a)	Find the ultimate tensile strength for a glass/epoxy lamina composite with a 70% fiber volume fraction. Where the ultimate tensile strength and Young's modulus of fiber are 1550 MPa and 85 GPa respectively. And the ultimate tensile strength and Young's modulus of the matrix are 72 MPa and 3.4 GPa respectively.	5	4	5	2
b)	Explain the maximum strain Theory for a unidirectional lamina subjected to planar stress.	3	4	5	2
16. a)	State the properties and applications of composite materials.	4	1	1	1
b)	Write a short note on the filament winding method to fabricate composite materials. Give the process advantages and disadvantages.	4	1	2	1
17.	Answer any ***two*** of the following:				
a)	Discuss the number of independent elastic constants for an orthotropic material indicating its stiffness matrix.	4	3	3	1
b)	What are inter-laminar stresses? State the factors that influence on nature, magnitude, and location of inter-laminar stresses.	4	1	4	2
c)	Explain the Tsai – Hill Theory Failure criteria in the case of Fibre reinforced composites.	4	2	5	2

	UTS	Modulus
Epoxy	57.9 MPa	3.8 GPa
Carbon fibers	2.4 GPa	399.9 GPa

M : Marks; L: Bloom's Taxonomy Level; CO; Course Outcome; PO; Programme Outcome

i)	Blooms Taxonomy Level – 1	20%
ii)	Blooms Taxonomy Level – 2	30%
iii)	Blooms Taxonomy Level – 3 & 4	50%

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