Model Question Paper-1 with effect from 2020-21 (CBCS Scheme)

USN | | | | | | | | | |

Fifth Semester B.E. Degree Examination

Introduction to Composites Materials

TIME: 03 Hours **Max. Marks: 100**

Note: 01. Answer any **FIVE** full questions, choosing at least **ONE** question from each **MODULE**.

Module – 1			
Q.1	**(a)**	Define composites and justify why the composites are better than the conventional materials	6
	(b)	Differentiate between thermosetting and thermoplastic polymers	7
	(c)	Discuss various fibers used in the composite manufacturing	7
OR			
Q.2	**(a)**	Classify composites based on reinforcements, the type of matrix and natural and man-made composites	8
	(b)	Explain metal matrix composites from Al, Si, Mg, Ti with examples	6
	(c)	List and explain the reinforcements used in the composites	6
Module – 2			
Q.3	**(a)**	With neat sketch explain the hand layup process in composite manufacturing	6
	(b)	Suggest the manufacturing process with neat sketch to produce cylindrical components	6
	(c)	Explain Pultrusion forming of composite manufacturing with advantages over other processes	8
OR			
Q.4	**(a)**	Explain the vacuum bag molding of composite manufacturing	6
	(b)	With neat diagram explain filament winding used for aerospace applications with an example	8
	(c)	Discuss the adhesives and cutting tools used for the composites	6
Module – 3			
Q.5	**(a)**	What are the assumptions in a typical micromechanical analysis	5

	(b)	Derive the equation for elastic modulus of a composite laminate.	7
	(c)	Calculate the modulus of elasticity of a composite material consisting of 60% by volume of continuous E-glass fiber and 40% epoxy resin for the matrix when stressed under iso-stress conditions. The modulus of elasticity of the E glass is 72.4 GPa and that of the epoxy resin is 3.1 GPa	8
		OR	
Q.6	(a)	Define volume and mass fractions for fibre and matrix and derive expressions for them	7
	(b)	What are the assumptions made in macro mechanics	5
	(c)	Using strength of materials approach, derive expressions for effective axial modulus, Poisson's ratio and transverse modulus	8
		Module – 4	
Q.7	(a)	Define composite failure and discuss the modes of failure in composites	6
	(b)	Explain maximum stress and maximum strain failure theories used in the composites	8
	(c)	What are the merits and demerits of Tsai-hill failure theory?	6
		OR	
Q.8	(a)	Explain the basic assumptions in the classical laminate plate theory	5
	(b)	Derive the expressions for [A],[B] and [D] matrices for laminate	15
		Module – 5	
Q.9	(a)	Suggest the experimental setup to test composite for tension and shear properties	10
	(b)	Discuss various NDT used for the composites	10
		OR	
Q.10	(a)	Explain ultrasonic testing of composites mentioning its merits	6
	(b)	Discuss the applications of composites from day to day requirements to the advance applications in space with examples.	14

Table showing the Bloom's Taxonomy Level, Course Outcome and Programme Outcome

Question		Bloom's Taxonomy Level attached	Course Outcome	Programme Outcome
Q.1	(a)	L1	CO1	PO1
	(b)	L2	CO1	PO2
	(c)	L3	CO1	PO5
Q.2	(a)	L2	CO1	PO6
	(b)	L3	CO1	PO5
	(c)	L1	CO1	PO4
Q.3	(a)	L1	CO2	PO3
	(b)	L2	CO2	PO5
	(c)	L3	CO2	PO3
Q.4	(a)	L1	CO2	PO1
	(b)	L2	CO2	PO2
	(c)	L1	CO2	PO5
Q.5	(a)	L1	CO3	PO6
	(b)	L2	CO3	PO5
	(c)	L3	CO3	PO4
Q.6	(a)	L2	CO3	PO3
	(b)	L1	CO3	PO5
	(c)	L3	CO3	PO3
Q.7	(a)	L2	CO3	PO3
	(b)	L3	CO3	PO5
	(c)	L3	CO3	PO3
Q.8	(a)	L2	CO3	PO5
	(b)	L3	CO3	PO3
Q.9	(a)	L4	CO2	PO5
	(b)	L2	CO2	PO3
Q.10	(a)	L2	CO2	PO7
	(b)	L4	CO2	PO3

Bloom's Taxonomy Levels	**Lower order thinking skills**		
	Remembering(knowledge): L_1	Understanding Comprehension): L_2	Applying (Application): L_3
	Higher order thinking skills		
	Analyzing (Analysis): L_4	Valuating (Evaluation): L_5	Creating (Synthesis): L_6

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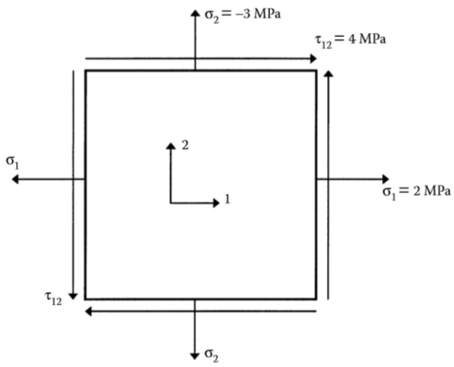
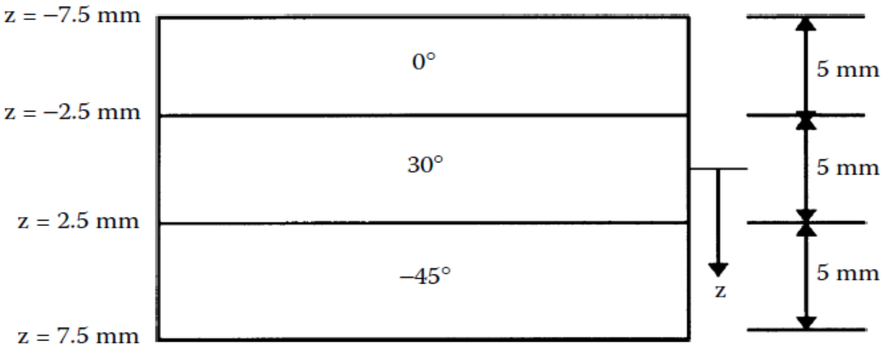
Fifth Semester B.E. Degree Examination
INTRODUCTION TO COMPOSITE MATERIALS

TIME: 03 Hours **Max. Marks: 100**

Note: 01. Answer any **FIVE** full questions, choosing at least **ONE** question from each **MODULE**.

		Module – 1	
Q.1	**(a)**	Define a composite material and give the broad classification of it and explain	10
	(b)	Explain with neat sketch Stir casting and Squeeze casting process	10
		OR	
Q.2	**(a)**	Explain with a neat sketch solid state processing of MMC	10
	(b)	Write a short note on processing of carbon-carbon composites and mention its applications	10
		Module – 2	
Q.3	**(a)**	Explain Vacuum Bagging process with neat sketch and mention its advantage, disadvantage and application of the applications of the process	10
	(b)	With a neat labeled sketch explain the Autoclave process and mention its advantage , disadvantage and applications	10
		OR	
Q.4	**(a)**	What is Secondary Process.? Explain with a neat sketch Ultrasonic cutting and Laser Beam Cutting process	10
	(b)	With a neat sketch explain Injection Moulding process and mention its advantages, disadvantages and applications	10
		Module – 3	
Q.5	**(a)**	Derive the equation for longitudinal young’s modulus by using strength of materials approach	10

	(b)	For a graphite/epoxy unidirectional lamina, find the following: 1. Compliance matrix 2. Minor Poisson's ratio 3. Reduced stiffness matrix 4. Strains in the 1–2 coordinate system if the applied stresses (Figure 5.1) are **σ_1= 2MPa ,σ_2= - 3Mpa, ζ_{12} = 4Mpa** Engineering elastic constants of the unidirectional graphite/ epoxy lamina properties areE$_1$ = 181 GPa , E$_2$ =10.3 GPa , G$_{12}$ = 7.17GPa ,υ_{12}= 0.28  Fig.5.1	10
		OR	
Q.6	**(a)**	Derive the equation for major Poisson's ratio by using strength of materials approach	10
	(b)	Derive the relation of Hooke's law for a Two-Dimensional Angle Lamina	10
		Module – 4	
Q.7	**(a)**	Explain the Following: i) Maximum stress failure theory ii) T-sai Hill failure theory	10
	(b)	Derive A B D matrix by considering force , stress-strains and moments	10
		OR	
Q.8	**(a)**	Find the three stiffness matrices [A], [B] and [D] for a three ply [0/30/-45] graphite/epoxy laminate as shown in fig (8.1). Use the unidirectional Properties of graphite/epoxy. Assume that each lamina has a thickness of 5mm. E$_1$= 181GPa, E$_2$ =10.3GPa υ_{12}= 0.28, G$_{12}$= 7.17GPa  Fig.8.1	20
		Module – 5	
Q.9	**(a)**	What is Destructive Testing? With a neat sketch explain the following:	10

		i)Hardness Test ii) Impact Test iii)Tensile Test	
	(b)	Write a note on Liquid Penetration Test and Magnetic Particle Test	10
OR			
Q.10	**(a)**	Explain brief the application of composite materials in following fields i)Aircraft ii)Automobile iii)Missiles iv)Electrical and Electronics v)Sports Equipment	20

Table showing the Bloom's Taxonomy Level, Course Outcome and Programme Outcome				
Question		**Bloom's Taxonomy Level attached**	**Course Outcome**	**Programme Outcome**
Q.1	(a)	L_2	CO1	PO1
	(b)	L_2	CO1	PO1
Q.2	(a)	L_2	CO1	PO1
	(b)	L_2	CO1	PO1
Q.3	(a)	L_2	CO2	PO1
	(b)	L_2	CO2	PO1
Q.4	(a)	L_2	CO2	PO1
	(b)	L_2	CO2	PO1
Q.5	(a)	L_3	CO3	PO2
	(b)	L_3	CO3	PO2
Q.6	(a)	L_3	CO3	PO2
	(b)	L_3	CO3	PO2
Q.7	(a)	L_2	CO4	PO1
	(b)	L_3	CO4	PO1
Q.8	(a)	L_3	CO4	PO2
Q.9	(a)	L_2	CO5	PO1
	(b)	L_2	CO5	PO1
Q.10	(a)	L_2	CO5	PO1

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