

BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(END SEMESTER EXAMINATION)

CLASS: BTECH
BRANCH: MECHANICAL

SEMESTER : IV
SESSION : SP/2024

SUBJECT: ME215 COMPOSITE MATERIALS

TIME: 3 Hours

FULL MARKS: 50

INSTRUCTIONS:

1. The question paper contains 5 questions each of 10 marks and total 50 marks.
 2. Attempt all questions.
 3. The missing data, if any, may be assumed suitably.
 4. Before attempting the question paper, be sure that you have got the correct question paper.
 5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.
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		CO	BL
Q.1(a)	Define Composite and explain the terms CMC, MMC and PMC with suitable examples	[5]	1 M
Q.1(b)	Explain the role of reinforcing phase and matrix phase in the formation of polymer composites.	[5]	1 M
Q.2(a)	Prove	[5]	2 M
	$E_2 = \frac{E_f E_m}{(1 - \phi_f) E_f + \phi_f E_m}$		
	Where E is Young's Modulus and ϕ is the volume fraction. f and m are for fibre and matrix respectively		
Q.2(b)	A composite material consists of 40% (by volume) continuous, uniaxially aligned, glass fibres in a matrix of thermoset polyester. A tensile stress of 150 MPa is to be applied parallel to the fibres. Predict the strains which will result. Take the tensile modulus and Poisson's ratio of glass to be 77 GPa and 0.21, and of thermoset polyester to be 3 GPa and 0.39, respectively.	[5]	2 M
Q.3(a)	Define ablative composites. Discuss the properties and applications with suitable example.	[5]	3 L
Q.3(b)	Explain Carbon - Carbon Composites elaborating the manufacturing considerations and applications.	[5]	3 M
Q.4(a)	Discuss and briefly classify functionally graded composite materials with the aid of a flowchart	[5]	4 M
Q.4(b)	Describe polymer nano-composites. How do they differ from other composites? Write their advantages and disadvantages	[5]	4 L
Q.5(a)	Using relevant sketches explain the following techniques for fabrication of polymer composites: i) Extrusion ii) Pultrusion iii) Filament Winding iv) Hand Layup v) Spray up	[5]	5 M
Q.5(b)	Provide the salient points for the following testing techniques for polymer composites citing the relevant standards: i) Void Test ii) Hardness Test iii) Tensile Test iv) Flexural Test v) Izod Impact test	[5]	5 M

:::26/04/2024:::M