Total No. of Questions – [6]   Total No. of Printed Pages: 2

G.R. No.	

December 2021 ~~May/August 2022~~ / INSEM+ENDSEM

F. Y. M. TECH. (MECHANICAL DESIGN ENGINEERING) (SEMESTER – I)
COURSE NAME: MECHANICS OF COMPOSITE MATERIALS
COURSE CODE: MEPA11203
(PATTERN 2020)

Time: [3 Hours]   [Max. Marks: 60]

(*) Instructions to candidates:
1)   All Questions are compulsory
2)   Figures to the right indicate full marks.
3)   Use of scientific calculator is allowed
4)   Use suitable data where ever required

Q.1)	a)	Discuss thermoset and thermoplastic matrix material. Give Examples of each	[4]
	b)	Elaborate the role of fibers and matrix in composite material	[4]
	c)	List synthetic and natural fibers	[2]
Q.2)	a)	Explain below manufacturing method (Any one) with neat sketch, process, advantages , disadvantages and applications i) Filament winding ii) Pultrusion	[6]
	d)	State the ASTM standards for Tensile Test, Compression Test, Flexural Test and Inplane Shear Test for fiber reinforced polymer matrix composite material. Also give the specimen dimensions for each test .	[4]
Q.3)	a)	Obtain the expression for Rule of Mixture (ROM) to determine strength and modulus of composite laminate	[6]
	b)	Longitudinal modulus of glass reinforced lamina is to be doubled by substituting some of the glass fibers with aramid fibers. The total fiber volume (kevlar+glass) remains unchanged at 0.5. Calculate volume fraction of carbon fibers. Given: Ek = 190 GPa , Eg = 65 GPa , Em = 5 GPa	[4]
Q.4		A high strength composite has the following elastic constants. E_1 = 145 GPa, E_2 = 12 GPa, G_{12}= 6 GPa, $\vartheta_{12} = 0.25$ and $\vartheta_{21} = 0.0207$ Determine the transformed reduced stiffness matrix [$\bar{Q}$] for the lamina with ply angle $\theta = 45^0$	[10]

Q.5		Using Classical Lamination Theory, determine [A], [B] and [D] matrices for [+45/-45] laminate with the following lamina properties. Thickness of each lamina is 0.125 mm. The material properties are E_1=140GPa, E_2= 10 GPa, E_6= G_{12}=5 GPa, v_{12} = 0.3.	[10]
Q.6	a)	Discuss special types of laminates, their designation and example	[6]
	b)	A [+45/-45/-45/+45] symmetric laminate subjected to N_x =100 and extensional stiffness matrix is given as $$[A] = \begin{bmatrix} 187 & 4.34 & 0 \\ 4.34 & 101 & 0 \\ 0 & 0 & 10.7 \end{bmatrix}$$ Calculate midplane strains	[4]