RollNo. | | | | | | | | | | |

ANNA UNIVERSITY (UNIVERSITY DEPARTMENTS)

B.E. /B.Tech / B. Arch (Full Time) - END SEMESTER EXAMINATIONS, NOV / DEC 2024

MATERIALS SCIENCE AND ENGINEERING
VI Semester
ML5601 – COMPOSITE MATERIALS
(Regulation2019)

Time:3hrs Max.Marks: 100

On completion of this course, the students can able to

CO 1	Design and fabricate composite structures
CO 2	Identify suitable process for different composite components
CO 3	Design new composites materials for specific requirement.
CO 4	Test and characterize the composites and qualify for the engineering acceptance
CO 5	Develop and use the constitutive equation for the composite components design

BL – Bloom's Taxonomy Levels
(L1-Remembering, L2-Understanding, L3-Applying, L4-Analysing, L5-Evaluating, L6-Creating)

PART- A(10x2=20Marks)
(Answer all Questions)

Q.No.	Questions	Marks	CO	BL
1	Composite Materials cannot be used as a material for fishing boat: True or false-Justify your answer	2	1	2
2	Why in fiber form, the fibers are flexible?	2	1	1
3	What are prepregs?	2	2	1
4	Classify the interface bonding based on the wetting angle	2	2	1
5	Distinguish between interface and interphase	2	3	2
6	Why surface treatment of fibers necessary?	2	3	2
7	What are the ways the porous structure of C/C composites can be eliminated?	2	4	1
8	Weak interface bonding is desired in CMC-True or false Justify your answer	2	4	2
9	What is symmetric and quasi isotropic laminates	2	5	2
10	Calculate the number of layers in the laminates: $((\pm 45/\pm 60)_2/90_2/0_2)_3)_s$	2	5	2

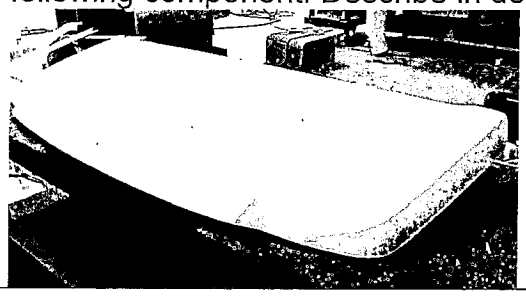
PART- B(5x 13=65Marks)
(Restrict to a maximum of 2 subdivisions)

Q.No.	Questions	Marks	CO	BL
11 (a)(i)	Illustrate the strengthening mechanism of particle reinforced composites and Fiber reinforced composites.	8	1	3
(ii)	You are asked to select Carbon fibers for a high temperature application. Suggest your selection with proper justification	5	1	3
	OR			
11 (b) (i)	How do you select the matrix and reinforcement materials for PMC, MMC and CMC.	8	1	3
(ii)	What type of types of glass fibers will you suggest for frames of doors	5	1	3
12 (a)	Explain a suitable technique to produce composite helmet and	13	2	3

	design a process sequence to fabricate the same.			
	OR			
12 (b)	Suggest a suitable method and associated components selection to fabricate the composite component shown 	**13**	2	3
13 (a)	A fiber reinforced composites fails at lower stress due to imperfect interface binding, suggest different mechanisms responsible for bonding at the interface.	**13**	3	3
	OR			
13 (b)	Al-TiB_2 composite produced by stir casting has porosity and imperfect bonding, suggest an alternate route to produce the same	**13**	3	3
14 (a)	Derive an expression for E1 and E2 of composite	**13**	4	3
	OR			
14 (b)(i)	Suggest and explain a suitable reaction to fabricate nitride based CMC	**8**	4	3
(ii)	Describe liquid impregnation technique to fabricate glass based composite	**5**	4	3
15 (a)	Derive reduced compliance matrix for laminate.	**13**	5	3
	OR			
15 (b)	Consider a three ply laminate. The top and bottom layers are each 3mm thick and oriented at 45° to the laminate reference axis, whereas the 6mm thick middle layer is oriented at 0°. The stiffness matrix Q, referred to the principal material directions are the same for the two layers $Q_{ij} = \begin{matrix} 20 & 0.7 & 0 \\ 0.7 & 2.0 & 0 \\ 0 & 0 & 0.7 \end{matrix}$ GPa Find the $[Q_{ij}]_{45}$ and then compute [A], [B], and [D] for this laminate	**13**	5	3

PART- C(1x 15=15Marks)

(Q.No.16 is compulsory)

Q.No.	Questions	Marks	CO	BL
16.	Identify and explain a suitable fabrication technique which should have a shorter production time for fabricating the following component. Describe in details of the process. 	15	5	4