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NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA
(An Autonomous Institute Affiliated to AKTU, Lucknow)

M.Tech

SEM: II - THEORY EXAMINATION (2024 - 2025)

Subject: Composite Materials

Time: 3 Hours

Max. Marks: 70

General Instructions:

IMP: Verify that you have received the question paper with the correct course, code, branch etc.

1. This Question paper comprises of **three Sections -A, B, & C**. It consists of Multiple Choice Questions (MCQ's) & Subjective type questions.
2. Maximum marks for each question are indicated on right -hand side of each question.
3. Illustrate your answers with neat sketches wherever necessary.
4. Assume suitable data if necessary.
5. Preferably, write the answers in sequential order.
6. No sheet should be left blank. Any written material after a blank sheet will not be evaluated/checked.

SECTION-A

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1. Attempt all parts:-

- 1-a. Composite materials are classified based on: (CO1, K1) 1
- (a) Type of matrix
 - (b) Size-and-shape of reinforcement
 - (c) Both
 - (d) None
- 1-b. Fibre Reinforced Polymer (FRP) Composites are composed of _____ (CO2, K1) 1
- (a) Ceramic fibres in ceramic matrix
 - (b) Metallic fibres in metal matrix
 - (c) Fibres embedded in a polymer matrix
 - (d) Particulates in a metallic matrix
- 1-c. Bleeder plies are used to: (CO3, K1) 1
- (a) Add stiffness to the part
 - (b) Remove excess resin
 - (c) Allow airflow
 - (d) Act as a mould release
- 1-d. Which of the following is/are the property(ies) of the Titanium Matrix Composite? (CO4, K1) 1
- (a) High Strength

- (b) Low Stiffness
 - (c) Low creep resistance
 - (d) None of these
- 1-e. Which of the following laminate types has mirror symmetry about its mid-plane? (CO5, K1) 1
- (a) Balanced laminate
 - (b) Antisymmetric laminate
 - (c) Angle-ply laminate
 - (d) Symmetric laminate
2. Attempt all parts:-
- 2.a. What are the primary functions of the matrix in a composite material? (CO1, K2) 2
- 2.b. What are the advantages of laminar composites over particulate ones? (CO2, K2) 2
- 2.c. What is the function of a release agent in composite manufacturing? (CO3, K2) 2
- 2.d. What are the properties of composite materials? Also, which composite is superior? (CO4, K2) 2
- 2.e. What are the fundamental assumptions made in Classical Laminate Theory (CLT)? (CO5, K2) 2

SECTION-B

20

3. Answer any five of the following:-

- 3-a. What is the role of carbon fibres in composites? (CO1, K2) 4
- 3-b. What are the criteria for selecting reinforcement materials for specific composite applications? (CO1, K2) 4
- 3-c. What are the advantages and limitations of composite materials compared to conventional metals? (CO2, K2) 4
- 3-d. Why are composites often preferred in aerospace or automotive applications? Explain in brief. (CO2, K2) 4
- 3.e. What are the purpose of bagging films in composite fabrication? Explain in brief. (CO3, K2) 4
- 3.f. Explain the procedures involved in the compression testing of composite materials. (CO4, K2) 4
- 3.g. What are cross-ply, and angle-ply laminate? Explain the properties and applications of each. (CO5, K2) 4

SECTION-C

35

4. Answer any one of the following:-

- 4-a. Distinguish between Polymer Matrix Composites (PMC), Metal Matrix Composites (MMC), and Ceramic Matrix Composites (CMC) with a suitable examples. (CO1, K2) 7
- 4-b. Compare the properties and applications of glass fibres and carbon fibres. Also, explain the mechanical properties of aramid fibres and their industrial 7

applications. (CO1, K2)

5. Answer any one of the following:-

- 5-a. Explain the impact of reinforcement type (fibres, particulates, laminar) on the mechanical behaviour and application of composite materials. (CO2, K2) 7
- 5-b. What the various grades of glass fibres used as reinforcement in glass fibre reinforcement plastic (GRP)? Discuss any two in brief. (CO2, K2) 7

6. Answer any one of the following:-

- 6-a. What are the different methods for fabrication of metal matrix composites? Explain in detail the liquid metal infiltration ? (CO3, K2) 7
- 6-b. Compare and contrast compression moulding, pultrusion, and filament winding in terms of: (CO3, K2) 7
 - i. Material form used
 - ii. Final product shape
 - iii. Cost and scalability

7. Answer any one of the following:-

- 7-a. What are woven reinforcements? Discuss their advantages and disadvantages in structural applications. (CO4, K2) 7
- 7-b. Describe the mechanical behavior of short fibre systems. How do aspect ratio and orientation affect their performance? (CO4, K2) 7

8. Answer any one of the following:-

- 8-a. What is a quasi-isotropic laminate? Discuss its characteristics and typical applications. (CO5, K2) 7
- 8-b. What are hygrothermal stresses in laminates? Explain their origin and influence on laminate performance. (CO5, K2) 7