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

**M.Tech (Working Professional)**

**SEM: II - THEORY EXAMINATION (2025 - 2026)**

**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**

15

1. Attempt all parts:-

- (1.1) Composites can be classified based on \_\_\_\_\_ (CO1, K1) 1
- (a) matrix type
  - (b) reinforcement constituent
  - (c) matrix type & Reinforcement constituent
  - (d) neither on matrix type nor on reinforcement constituent type
- (1.2) What is the aspect ratio? (CO2, K1) 1
- (a) Length to diameter ratio
  - (b) Length to depth ratio
  - (c) Depth to length ratio
  - (d) Diameter to length ratio
- (1.3) What can be the best practice for a high-quality product design? (CO3, K1) 1
- (a) Maximizing the number of parts
  - (b) Creating the multifunctionality in the part
  - (c) Maximizing the part variations
  - (d) None of these
- (1.4) The heating technique in which the heat is generated by passing an electric current through the carbon fibers is known as: (CO4, K1) 1
- (a) Resistance Heating
  - (b) Roller Heating
  - (c) Open Flame Heating
  - (d) None of these

- (1.5) What will be the volume fraction of these reinforcement if the density of the reinforcement and the composite is 10 g/cm<sup>3</sup> and 15 g/cm<sup>3</sup>? (CO5, K2) 1
- (a) 0.67
- (b) 0.75
- (c) 1.5
- (d) None of these

2. Attempt all parts:-

- (2.1) What is a composite? (CO1, K1) 2
- (2.2) Which material can be used both as a matrix material and reinforcement in composite? (CO2, K1) 2
- (2.3) What is the application of an autoclave? (CO3, K2) 2
- (2.4) Why does Stress Intensity Factor decrease while increasing plate thickness? (CO4, K2) 2
- (2.5) What are laminae? (CO5, K1) 2

### **SECTION-B**

20

Answer any one of the following:-

- (3.1) What is the role of carbon fibres in composites? (CO1, K2) 4
- (3.2) Explain difference between fibers and whiskers. (CO1, K2) 4

Answer any one of the following:-

- (3.3) How are composites classified? Briefly explain each type of composites with their merits and demerits. (CO2, K2) 4
- (3.4) Explain briefly about the properties of ceramics. (CO2, K3) 4

Answer any one of the following:-

- (3.5) What is the structural makeup (manufacturing process) of GFRP materials? (CO3, K2) 4
- (3.6) State the rule of mixtures in composites. (CO3, K2) 4

Answer any one of the following:-

- (3.7) Explain how a carbon fiber reinforced glass-ceramic composite can be obtained with an almost zero in-plane coefficient of thermal expansion. (CO4, K2) 4
- (3.8) Explain the procedures involved in the compression testing of composite materials. (CO4, K2) 4

Answer any one of the following:-

- (3.9) What is the major reason to use beam elements instead of shell elements for the stiffeners in stiffened panels? (CO5, K3) 4
- (3.10) Briefly explain the yield criteria used for the failure analysis of composite materials. (CO5, K3) 4

### **SECTION-C**

35

4. Answer any one of the following:-

- (4.1) Describe the structure and properties of some fiber reinforced composites that occur in nature. (CO1, K3) 7

- (4.2) Glass fibers are complex mixtures of silicates and borosilicates containing mixed sodium, potassium, calcium, magnesium, and other oxides. Such a glass fiber can be regarded as an inorganic polymeric fiber. Do you think you can provide the chemical structure of such a inorganic fiber chain? (CO1, K4) 7
5. Answer any one of the following:-
- (5.1) What are Carbon-Carbon composites? Discuss the advantages and challenges in manufacturing carbon matrix composites. (CO2, K2) 7
- (5.2) Discuss the functions of matrix and dispersed phase in fiber reinforced and particle reinforced composites. (CO2, K3) 7
6. Answer any one of the following:-
- (6.1) Write a short note on spray co-deposition process with a neat sketch. (CO3, K2) 7
- (6.2) Explain any two conventional techniques applied for the fabrication of cmcs. (CO3, K2) 7
7. Answer any one of the following:-
- (7.1) Discuss the tensile behavior of continuous and discontinuous fiber composites briefly. (CO4, K3) 7
- (7.2) What are the objections to the use of short beam shear test to measure the interlaminar shear strength (ILSS)? (CO4, K3) 7
8. Answer any one of the following:-
- (8.1) Explain monoclinic material with compliance and stiffness matrices. (CO5, K3) 7
- (8.2) Derive the expressions for resultant in plane forces and bending moments for laminate (CO5, K3) 7