

**GUJARAT TECHNOLOGICAL UNIVERSITY****BE- SEMESTER- VI EXAMINATION – SUMMER 2026****Subject Code:3160112****Date:26-05-2026****Subject Name:Composite Materials****Time:10:30 AM TO 01:00 PM****Total Marks:70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.
4. Simple and non-programmable scientific calculators are allowed.

|            |                                                                                                                                                                                                                                                                         | <b>MARKS</b> |
|------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|
| <b>Q.1</b> | (a) What is composite material? Classify Constituent materials.                                                                                                                                                                                                         | <b>03</b>    |
|            | (b) What is the need of Fillers? Explain in details.                                                                                                                                                                                                                    | <b>04</b>    |
|            | (c) What is the need of Composite materials in the field of Aviation?                                                                                                                                                                                                   | <b>07</b>    |
| <b>Q.2</b> | (a) Write down types of FIBER in composite?                                                                                                                                                                                                                             | <b>03</b>    |
|            | (b) What is Prepeg? Explain.                                                                                                                                                                                                                                            | <b>04</b>    |
|            | (c) Derive In plane Shear modulus with neat sketch.                                                                                                                                                                                                                     | <b>07</b>    |
|            | <b>OR</b>                                                                                                                                                                                                                                                               |              |
|            | (c) Derive equations for volume and weight fractions.                                                                                                                                                                                                                   | <b>07</b>    |
| <b>Q.3</b> | (a) How many numbers of independent elastic constants for Isotropic material?                                                                                                                                                                                           | <b>03</b>    |
|            | (b) Explain about Carbon fibers.                                                                                                                                                                                                                                        | <b>04</b>    |
|            | (c) Stress-strain relation of specially Orthotropic Material.                                                                                                                                                                                                           | <b>07</b>    |
|            | <b>OR</b>                                                                                                                                                                                                                                                               |              |
| <b>Q.3</b> | (a) Define Lamina and laminate.                                                                                                                                                                                                                                         | <b>03</b>    |
|            | (b) What are the characteristics of super alloys?                                                                                                                                                                                                                       | <b>04</b>    |
|            | (c) Explain stress-strain relation of an Isotropic Material.                                                                                                                                                                                                            | <b>07</b>    |
| <b>Q.4</b> | (a) Define Isotropic and Anisotropic body.                                                                                                                                                                                                                              | <b>03</b>    |
|            | (b) What is FRP? Write characteristics and advantages of FRPs.                                                                                                                                                                                                          | <b>04</b>    |
|            | (c) A unidirectional fiber reinforced composite contains 55 % by volume of fibers. Evaluate the longitudinal tensile modulus and strength of this FRC.<br>Given $E_{1f}=300\text{GPa}$ , $\sigma_{1f}=5.6\text{GPa}$ , $E_m=3.5\text{GPa}$ , $\sigma_m=100\text{MPa}$ . | <b>07</b>    |
|            | <b>OR</b>                                                                                                                                                                                                                                                               |              |
| <b>Q.4</b> | (a) How many numbers of independent elastic constants for monoclinic material?                                                                                                                                                                                          | <b>03</b>    |
|            | (b) Write a note on Poisson's ratio.                                                                                                                                                                                                                                    | <b>04</b>    |
|            | (c) Discuss in details anti symmetric laminates.                                                                                                                                                                                                                        | <b>07</b>    |
| <b>Q.5</b> | (a) Explain Mechanical Behavior of Composite Materials.                                                                                                                                                                                                                 | <b>03</b>    |
|            | (b) Compare Polyester resins with Epoxy resins.                                                                                                                                                                                                                         | <b>04</b>    |
|            | (c) Write a note on Aramid fibers.                                                                                                                                                                                                                                      | <b>07</b>    |
|            | <b>OR</b>                                                                                                                                                                                                                                                               |              |
| <b>Q.5</b> | (a) Why is Aluminum Alloys used in aircraft manufacturing?                                                                                                                                                                                                              | <b>03</b>    |
|            | (b) Derive Strain-Displacement relationship of a laminate along with neat sketch stating all the necessary assumptions.                                                                                                                                                 | <b>04</b>    |
|            | (c) Explain Quasi-Isotropic Laminate.                                                                                                                                                                                                                                   | <b>07</b>    |

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