Seat No.: _____ Enrolment No._____

# GUJARAT TECHNOLOGICAL UNIVERSITY

**BE - SEMESTER–VI (NEW) EXAMINATION – WINTER 2023**

**Subject Code:3160112 Date:07-12-2023**

**Subject Name: Composite Materials**

**Time:02:30 PM TO 05:00 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.**

| | | | MARKS |
|---|---|---|---|
| **Q.1** | **(a)** | What is a composite material? | **03** |
| | **(b)** | Give classification of composites in detail. | **04** |
| | **(c)** | Derive longitudinal strength and stiffness for unidirectional lamina. | **07** |
| **Q.2** | **(a)** | What is the need of Fillers? Explain in details. | **03** |
| | **(b)** | Write a note on Equilibrium equations. | **04** |
| | **(c)** | Explain different types of fibers. | **07** |
| | | **OR** | |
| | **(c)** | Derive inplane shear modulus for unidirectional lamina. | **07** |
| **Q.3** | **(a)** | Define Lamina and laminate. | **03** |
| | **(b)** | What is FRP? Write characteristics and advantages of FRPs. | **04** |
| | **(c)** | Describe the stress-strain relations for plane stress in an orthotropic material. | **07** |
| | | **OR** | |
| **Q.3** | **(a)** | How many number of independent elastic constants for monoclinic material? | **03** |
| | **(b)** | What is transformation of stress and strain? | **04** |
| | **(c)** | Explain different types of thermoset polymers. | **07** |
| **Q.4** | **(a)** | Define Isotropic and Anisotropic body. | **03** |
| | **(b)** | What is Prepeg? Explain. | **04** |
| | **(c)** | A glass /epoxy specimen weighing 0.98 gm was burnt and the weight ofthe remaining fibers was found to be 0.49 gm. Densities of glass and epoxy are 2.4 gm/ml and 1.2 gm/ml respectively. Determine the densityof composites in the absence of voids. | **07** |
| | | **OR** | |
| **Q.4** | **(a)** | Write a note on Poisson's ratio with reference of composite material. | **03** |
| | **(b)** | Explain the stress strain relationship of a specially orthotropic material and Transversely Isotropic material. | **04** |
| | **(c)** | The E-glass fibers in polyester is 35% by weight. Given Density of fiber is 2.50gm/ml and density of matrix is 1 gm/ml Calculate fiber volume fraction and density of composite for the lamina. | **07** |
| **Q.5** | **(a)** | What are the characteristics of super alloys? | **03** |
| | **(b)** | Explain stress-strain relation of an Isotropic Material. | **04** |
| | **(c)** | Write note on Poisson's ratio and its Mismatch effect. | **07** |
| | | **OR** | |
| **Q.5** | **(a)** | Compare Polyester resins with Epoxy resins. | **03** |
| | **(b)** | What are the basic assumption for analysis of laminated composites? | **04** |
| | **(c)** | Derive Strain-Displacement relationship of a laminate along with a neat sketch stating all the necessary assumptions. | **07** |

**********