Seat No./Enrollment No.: _____

GUJARAT TECHNOLOGICAL UNIVERSITY
BACHELOR OF ENGINEERING – SEMESTER 6 – EXAMINATION – SUMMER 2026

Subject Code: 3164103 **Date: 29/05/2026**

Subject Name: Modelling and Simulation

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.**

Q.1	**(a)**	List advantages of modeling and simulation.	**03**
	(b)	What is the primary purpose of data exchange standards in computer-aided design, and why are they vital for collaborative engineering projects?	**04**
	(c)	What role does Modeling and Simulation play in product data management and communication?	**07**
Q.2	**(a)**	Distinguish briefly between Bottom-Up and Top-Down assembly design approaches.	**03**
	(b)	Elaborate on the architecture and application of the Graphical Kernel System (GKS) as a standard for computer graphics.	**04**
	(c)	Discuss Open Graphics Library (OpenGL) in detail.	**07**
		OR	
Q.2	**(c)**	Explain parametric representation with example.	**07**
Q.3	**(a)**	Differentiate between a node and an element within a discretized mesh.	**03**
	(b)	Explain the concepts of Mesh Refinement and Mesh Enrichment.	**04**
	(c)	Discuss the step-by-step generalized procedure of the Finite Element Method (FEM) for solving a continuum structural engineering problem.	**07**
		OR	
Q.3	**(a)**	What is a Natural Co-ordinate System and what is its main advantage over a global coordinate system?	**03**
	(b)	Explain different Boolean commands used for modeling.	**04**
	(c)	List and explain types of elements used in modeling.	**07**
Q.4	**(a)**	Differentiate between a Scalar Variable Problem and a Vector Variable Problem regarding degrees of freedom per node.	**03**
	(b)	Compare the structural differences, strengths, and standard applications of IGES and STEP data exchange standards.	**04**
	(c)	Explain the step-by-step mathematical framework of Variational Formulation (Rayleigh-Ritz Method).	**07**
		OR	
Q.4	**(a)**	What do you mean by Boundary Condition in the field of modeling?	**03**
	(b)	Discuss the engineering challenges associated with handling interferences of positions and orientation when combining parts from different designers in a unified assembly environment.	**04**

(c) Differentiate clearly between the assumptions and application boundaries of Plane Stress and Plane Strain formulations in 2D vector problems. **07**

Q.5 **(a)** Define Von Mises Stress and state why it is widely used by design engineers to predict failure. **03**

(b) Define the term Poisson's Ratio and state its typical range for engineering metals. **04**

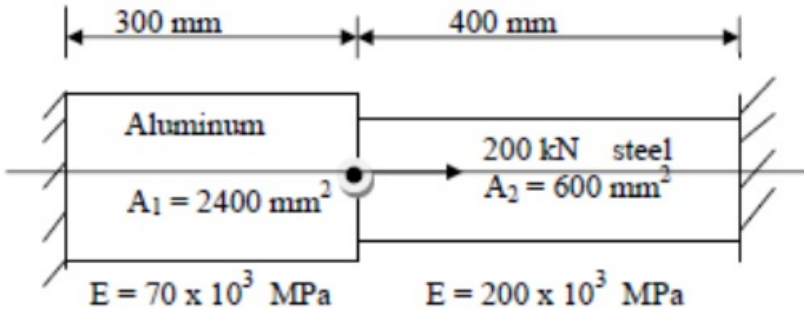
(c) Discuss different types of analysis for FEM, also mention advantages and limitations of FEM. **07**

OR

Q.5 **(a)** Explain the importance of "Discretization" in FEA. What happens if the mesh size is made extremely fine? **03**

(b) Name three commercial CAD/CAE software packages commonly used in engineering industries for modeling and simulation. **04**

(c) Figure shows the compound section fixed at both ends. Estimate the reaction forces at the supports and the stresses in each material when a force of 200 kN is applied at the change of cross section. **07**



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