Seat No./Enrollment No.: _____

GUJARAT TECHNOLOGICAL UNIVERSITY
BACHELOR OF ENGINEERING – SEMESTER 3 – EXAMINATION – SUMMER 2026

Subject Code: 3130608 **Date: 24/06/2026**

Subject Name: Mechanics of Solids

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.**

Q.1	**(a)**	Explain : (i) Type of beams (ii) Type of loading on the beams.	**03**
	(b)	Derive the relation, with usual notations, among loading, shear force and bending moment at a section for a determinate beam.	**04**
	(c)	Explain :(i) Principle of transmissibility, (ii) Principle of superposition (iii)Law of parallelogram of forces	**07**
Q.2	**(a)**	Explain in brief Coplanar concurrent and non-concurrent force system.	**03**
	(b)	Define Point of contra flexure, point & magnitude of maximum bending moment, maximum shear force	**04**
	(c)	Enlist Assumptions and derive equation of bending.	**07**
		OR	
Q.2	**(c)**	Calculate support reactions for the simply supported beam carrying point load W kN at the center of the span .Also plot Bending Moment and Shear Force diagrams showing values.	**07**
Q.3	**(a)**	State and explain the Law of polygon of forces.	**03**
	(b)	From first principle obtain the location of center of gravity of semi-circular lamina.	**04**
	(c)	Derive equation of torsion.	**07**
		OR	
Q.3	**(a)**	Define principal stresses and principal planes .	**03**
	(b)	Define:(i) Modulus of elasticity, (ii) Poisson's ratio, (iii) Modulus of rigidity (iv) bulk modulus	**04**
	(c)	Explain Mohr's circle of stress,	**07**
Q.4	**(a)**	State and explain The Lami's theorem.	**03**
	(b)	State and explain Pappus – Guldinus first and second theorems.	**04**
	(c)	Define following : i. Moment of inertia of a section, ii. Polar moment of inertia, iii. Radius of gyration iv. Section Modulus	**07**
		OR	
Q.4	**(a)**	Using first principle, obtain the distance of centroid of a right-angled triangular lamina from the base.	**03**
	(b)	State and explain Varignon's principal of moments.	**04**

(c) A simply supported beam of span 4.0 m having uniform section of size 200 mm width and 400 mm depth is loaded with uniformly distributed load of 40 kN/m over entire span. Determine the maximum bending moment along the span and draw the bending stress distribution across the section. **07**

Q.5 **(a)** State and explain Hook's law. **03**

(b) Explain Mohr's circle method with neat sketch for a section subjected to direct stresses along two perpendicular directions. **04**

(c) A solid shaft of 250 mm diameter has the same cross-sectional area as that of hollow shaft of the same material of inside diameter 200 mm. Find the ratio of power transmitted by the two shafts at same angular velocity. Also, compare angle of twist in equal lengths of these shafts when stressed to the same intensity. **07**

OR

Q.5 **(a)** Write assumption made in the theory of torsion. **03**

(b) A cantilever beam 2 m long has rectangular section 200 mm x 500 mm. Find out point load at free end of beam if permissible bending stress is $20N/mm^2$. **04**

(c) Determine moment of inertia of rectangular section with dimension b x d in mm, **07**

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