Enrollment No./Seat No.:

GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering - SEMESTER - III EXAMINATION - WINTER 2025

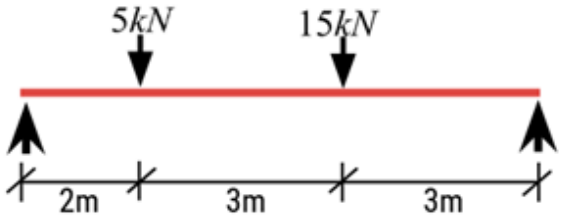
Subject Code: BE03001011 **Date: 17-12-2025**

Subject Name: Aeronautical Mechanics of Solids

Time: 10:30 AM TO 01:00 PM **Total Marks: 70**

Instructions

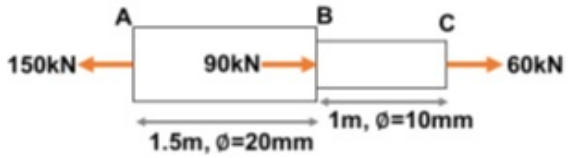
1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.
4. Simple and non-programmable scientific calculators are allowed.

			Marks
Q.1	**(a)**	State and explain the principle of transmissibility and its engineering applications.	**03**
	(b)	Derive law of parallelogram of forces.	**04**
	(c)	A force system consists of 100 N, 150 N, and 200 N forces acting at 0°, 120°, and 240° respectively. Find the resultant force magnitude and direction graphically or analytically.	**07**
Q.2	**(a)**	Explain the term Resultant, Equilibrant, Free body diagram.	**03**
	(b)	Find the resultant force and its direction for two coplanar concurrent forces 50 N and 30 N making an angle of 60 degree between them.	**04**
	(c)	A simply supported beam of span 4 m carries a UDL of 5 kN/m over an entire span. Find the reaction of the beam [R_A and R_B].	**07**
		OR	
	(c)	A cantilever beam of span 10 m carries a UDL of 10 kN/m over an entire span. Find the reaction of the beam [R_A].	**07**
Q.3	**(a)**	Discuss types of support for a beam with figure.	**03**
	(b)	Discuss types of Loads acting on a beam with figure.	**04**
	(c)	Draw the SFD and BMD for the following figure: 	**07**
		OR	
	(a)	Give assumptions for the theory of simple bending.	**03**
	(b)	Derive Parallel axis Theorem.	**04**
	(c)	A brass rod of 25 mm diameter is subjected to an axial pull of 50 kN. Calculate the stress, strain, and elongation for length 1.5 m if E = 100 GPa.	**07**

Q.4	**(a)**	Differentiate between Centroid and Centre of gravity.	**03**
	(b)	Find the centroid of L Section with flange 100 mm x 20 mm and web 90 mm x 20 mm.	**04**
	(c)	Find the Moment of Inertia along X-X and Y-Y axis for T- section having flange 60 mm x 10 mm and Web 60 mm x 10 mm.	**07**

OR

	(a)	Define Plane stress and Plane strain.	**03**
	(b)	Discuss Principle Stress and Principle Strain with figure.	**04**
	(c)	Define modulus of rigidity, bulk modulus, and Poisson's ratio. Derive its relation.	**07**
Q.5	**(a)**	Give Equilibrium conditions of coplanar non-concurrent force.	**03**
	(b)	Differentiate between Moment and Couple.	**04**
	(c)	Calculate total deformation in stepped bar shown in figure. Take modulus of elasticity for both members as 1.2 x 105 N/mm^2 .	**07**



OR

	(a)	Assumption of theory of torsion.	**03**
	(b)	At a point, the normal stresses are 50 MPa (tensile) and 30 MPa (compressive), and shear stress 20 MPa. Find principal stresses using formula.	**04**
	(c)	An element is located by tensile stress 5 MPa & compressive stress 4 MPa in perpendicular directions, along with shear stress 3 MPa. Calculate normal, tangential & resultant stress on a plane making 30 angle in anticlockwise direction with the plane carrying tensile stress.	**07**

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