Seat No.: _____ Enrolment No.

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER– IV EXAMINATION – SUMMER 2020

Subject Code: 2140603 **Date:28/10/2020**

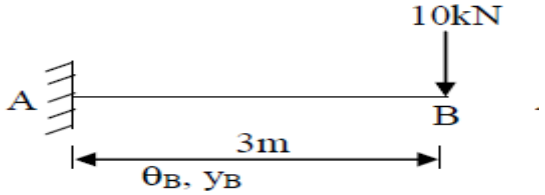
Subject Name: STRUCTURAL ANALYSIS-I

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.**

Q.1	**(a)**	State assumptions and limitations of Euler's formula.	**03**
	(b)	A thin cylindrical shell of internal diameter d, wall thickness t and length L, is subjected to internal pressure p. Derive the expression for change in volume of the cylinder.	**04**
	(c)	Give equations of Static and Kinematics Indeterminacy for the following structures with meaning of each term used. (i) Beam, (ii) Plane truss, (iii) Plane Frame ,(iv) Grid	**07**
Q.2	**(a)**	State and explain principle of superposition.	**03**
	(b)	Explain Maxwell's theorem of reciprocal deflections.	**04**
	(c)	A hollow cast iron column 6m long is fixed at both ends and has an external diameter of 300mm. The column supports an axial load of 1200kN. Find the internal diameter of the column, adopting a factor of safety of 4. Take fc=550N/mm^2 and ά=1/1600. E = 200 GPa	**07**
		OR	
	(c)	A cylindrical shell has 4.0 meter length, 1.2 meter diameter and 12 mm thickness. The shell is subjected to internal pressure of 3 N/mm^2.calculate maximum shear stress and change in dimension of shell.	**07**
Q.3	**(a)**	Find out fixed end moment for a fixed beam carrying uniformly distributed load w per meter length over entire span.	**03**
	(b)	State basic difference between fixed and simply supported beams. State advantages of fixed beam over simply supported beam.	**04**
	(c)	A fixed beam AB of span L carried a UDL of w per meter length over entire span. Support B settles during application of load. Calculate the settlement, so that there is no fixed end moment at B. Also find FEM at A.	**07**
		OR	
Q.3	**(a)**	State and explain moment area theorem.	**03**
	(b)	Differentiate between real beam and conjugate beam. Justify the support condition in conjugate beam.	**04**
	(c)	Find slope & deflection for the following structure by double integration method	**07**



Q.4	**(a)**	Define resilience, proof resilience and modulus of resilience.	**03**
	(b)	A simply supported beam AB of span 6m carries a uniformly distributed load of 8 kN/ m over its entire span. Determine strain energy stored in the beam due to bending in the beam. Take E =200GPa, I =300 cm^4.	**04**
	(c)	A steel rod is 3 m long and 50 mm in diameter. An axial pull of 40 kN is applied to the rod. Take E = 200 GN/m^2.Calculate (i) Stretch in the rod (ii) Stress in the rod (iii) Strain energy absorbed by the rod . In above if 40 kN load is suddenly applied ,determine (i) Instantaneous stress induced (ii) Instantaneous elongation produced in the rod.	**07**

OR

Q.4	**(a)**	Distinguish clearly between direct stress and bending stress.	**03**
	(b)	Show that for no tension in the base of a short column, the line of action of the load should be within the middle third.	**04**
	(c)	A masonry dam 6.0 m high has 1.0 m top width and 4.0m base width. It retains water on its vertical face for its total height. Determine the stresses that develop at its base and check the section for its stability. Assume the density of the masonry to be 24 kN /$m^{3,}$ safe bearing capacity of the soil as 150 kN /m^2 and the coefficient of friction between masonry and foundation bed as 0.3.	**07**
Q.5	**(a)**	State and explain Eddy's theorem.	**03**
	(b)	A three hinged parabolic arch has a span of 20m and central rise 4m. It carries a point load of 18 kN at 6 m from the left hinge. Calculate normal thrust, shear and B.M. at a section 4m from left end hinge. Also calculate maximum positive B.M. and it's position. Draw B.M. diagram.	**04**
	(c)	A three hinged parabolic arch of span L and central rise "yc" carries a uniformly distributed load of "w: per unit length over the left half of the span. Show that the max positive moment is equal to $wl^2/64$	**07**

OR

Q.5	**(a)**	Differentiate between (i) Static determinacy and static indeterminacy (ii) Kinematic determinacy and Kinematic indeterminacy	**03**
	(b)	Define the following terms. (i) Crippling load (ii) Effective length, (iii) radius of gyration, (iv) slenderness ratio.	**04**
	(c)	Find slope at A and deflection at E for a beam shown in figure either by Macaulay's method or by conjugate beam method .	**07**