Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–IV (NEW) EXAMINATION – WINTER 2018

Subject Code:2140603 Date:10/12/2018

Subject Name:Structural Analysis-I

Time: 02:30 PM TO 05:00 PM Total Marks: 70

Instructions:

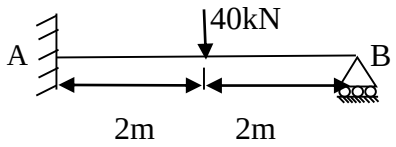
1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

Q.1	**(a)**	Find out fixed end moment for a fixed beam carrying uniformly distributed load for the whole span.	**03**
	(b)	Explain in detail various types of framed structures with neat sketches.	**04**
	(c)	Explain in detail: i. Maxwell's reciprocal them ii. Principal of superposition	**07**
Q.2	**(a)**	Justify the support condition in conjugate beam.	**03**
	(b)	State and explain moment area theorem.	**04**
	(c)	A hollow cast iron column 5m 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 5. Take fc=550N/mm2 and ά=1/1600. E = 200 GPa	**07**
		OR	
	(c)	Calculate the critical load for a strut which is made of a bar circular in section and 5m long and which is pin jointed ant both ends. The same bar when freely supported gives a mid-span deflection of 10mm under a load of 80N at the Centre.	**07**
Q.3	**(a)**	Draw a neat sketches of Kernel of following cross-section: a) Rectangular 300mm X 400mm b) Circular section with 300 mm diameter c) Square with 600 cm^2 area	**03**
	(b)	Obtain a relation for the maximum and minimum stresses at the base of a symmetrical column when it is subjected to an eccentric load about two axis.	**04**
	(c)	A short column of external diameter 50 cm and internal diameter 30 cm carries an eccentric load of 100 kN. Find the greatest eccentricity which the load can have without producing tension on the cross section.	**07**
		OR	
Q.3	**(a)**	Prove that the maximum strain energy stored in a body is given by ,$U= (\sigma^2/2E) \times$ Volume	**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**

Q.4 **(a)** Derive the equation of fixed end moment in a fixed beam of span 'L' having one of the support rotate clockwise θ **03**

(b) State basic difference between Continuous and simply supported beams. State advantages of Continuous beam over simply supported beam. **04**

(c) Using the method of consistent deformation compute all reactions and draw shear and moment diagrams. Take E=200GPa & I= $80X10^6mm^4$. **07**



OR

Q.4 **(a)** A thin cylindrical shell of diameter 1.2 m and thickness 15 mm is subjected to an internal pressure of 20 N/mm2. Find the circumferential and longitudinal stresses. **03**

(b) A thin spherical shell is of internal diameter 1 m and shell thickness 15 mm. Determine the pressure that can increase its volume by 80 x 10^3 mm^3. Take E = 200 GPa, 1/m = 0.3 **04**

(c) A masonry retaining wall trapezoidal in section 1 meter wide at the top and 3 meter wide at the base and 6 meter high, has a vertical earth face and retains earth level. i with the top of the wall. In the top 3 meters the weight of retained material is $18kN/m^3$, while below this level it is 21 kN/m^3. The angle of repose of the material is 30°. Taking the weight of masonry as 24 kN/m^3, calculate the maximum and minimum normal stress intensities at the base. **07**

Q.5 **(a)** Enlist the types of suspension bridges. **03**

(b) Explain Arch and Cable. **04**

(c) A cable of span 200 m and dip 20 m carries a load of 6 kN/m on horizontal span .Determine the maximum tension in the cable and its inclination at the supports if both the supports are at same level. Estimate the load transferred on the supporting tower if cables are passing over the smooth rollers. The back anchor cables are inclined 45°. **07**

OR

Q.5 **(a)** Define resilience, proof resilience and modulus of resilience. **03**

(b) Derive an expression for strain energy stored in a body **04**

i) The load is applied gradually
ii) The load is applied suddenly
iii) The load is applied with an impact

(c) A load of 100 N falls through a height of 2 cm onto a collar rigidly attached to the lower end of a vertical bar 1.5 m long and of 1.5 cm^2 cross-sectional area. The upper end of the vertical bar is fixed. Determine **07**

i)maximum instantaneous stress induced in the vertical bar
ii)maximum instantaneous elongation
ii)strain energy stored in the vertical rod

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