Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–V • EXAMINATION – SUMMER 2013

Subject Code: 150605 **Date: 03-06-2013**

Subject Name: Structural Analysis - III

Time: 10.30 am - 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)**	Explain the term shape factor and collapse load	**07**
	(b)	Give the uses of dome and beam curved in plan	**07**
Q.2	**(a)**	Calculate the shape factor for a square section arranged as shown in Figure 1.	**07**
	(b)	Obtain the formula to calculate plastic moment of resistance of a propped cantilever beam of span L carrying uniformly distributed load of W_c throughout the span.	**07**
		OR	
	(b)	Calculate plastic moment of resistance required for a fixed beam of span 10 m loaded by a collapse uniformly distributed load of 18 kN/m over left half 5 m and a collapse point load of 45 kN at 7.5 m from the left support.	**07**
Q.3	**(a)**	Formulate the stiffness matrix, $\boldsymbol{S}$, and load vector, $\boldsymbol{A_D}$-$\boldsymbol{A_{DL}}$, for the beam shown in the Figure 2. Take EI constant.	**07**
	(b)	For the above problem Q.3 (a), calculate the joint displacements using stiffness method and draw the shear force and bending moment diagrams.	**07**
		OR	
Q.3	**(a)**	Formulate the flexibility matrix, $\boldsymbol{F}$, and $\boldsymbol{D_Q}$-$\boldsymbol{D_{QL}}$ vector for the beam shown in the Figure 2. Assume reactions at supports B and C as redundants. Take EI constant.	**07**
	(b)	For the above problem Q.3 (a), calculate the values of all the unknown reactions using flexibility method and draw the shear force and bending moment diagrams.	**07**
Q.4	**(a)**	A curved beam circular in plan symmetrically supported on six columns has a radius of 6 m, carries uniformly distributed load of 40 kN/m, including self weight. Calculate shear force, bending moment and twisting moment at 10^0 interval.	**07**
	(b)	Derive the expression for Mφ and Tφ for a curved beam fixed at ends.	**07**
		OR	
Q.4	**(a)**	A spherical dome having 8 m span and 1.5 m rise is subjected to a load of 4 kN/m^2, including self weight and a lantern load of 1 kN at the crown. Thickness of the dome is 150 mm. Calculate stresses in the dome.	**07**
Q.4	**(b)**	A conical dome having 8 m span and 4.0 m rise is subjected to a load of 5 kN/m^2, including self weight and a concentrated load at vertex of 10 kN. Calculate stresses in the dome. The thickness of the dome is 100 mm.	**07**
Q.5	**(a)**	Differentiate between straight beam and curved beam.	**07**
	(b)	Derive an expression for stresses in conical dome subjected to concentrated load at crown.	**07**
		OR	
Q.5	**(a)**	Give the properties of flexibility and stiffness matrix.	**07**

(b) State and explain 'static theorem' and 'kinematic theorem' of plastic theory. **07**

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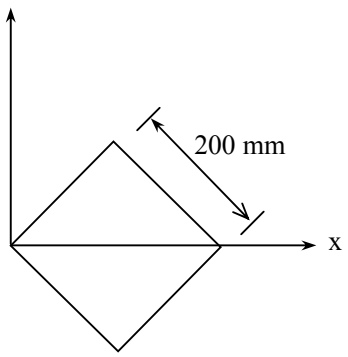

Figure 1

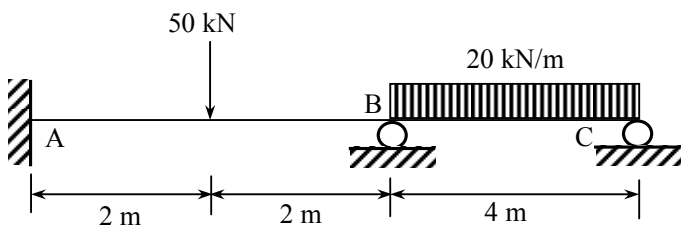

Figure 2