Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER– VI (NEW) EXAMINATION- WINTER 2016

Subject Code: 2150610 **Date: 24/11/2016**

Subject Name: Advanced Structural Analysis

Time: **Total Marks: 70**

Instructions:

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

			Marks
Q.1		**Short Questions**	**14**
	1	Define the flexibility coefficient Fij	
	2	Define the stiffness coefficient Sij.	
	3	Define mechanical hinge.	
	4	Define plastic hinge.	
	5	Plastic modulus of section.	
	6	Define Shape factor	
		Fill in the Blanks	
	7	The final size of the stiffness matrix depends on _____ indeterminacy.	
	8	The final size of the flexibility matrix depends on _____ indeterminacy.	
	9	In the plastic method of analysis the shape factor is the ratio of _____to_____.	
	10	Dome is the structure which resists force mainly by _____ stress and _____ stress.	
	11	The shape of the cross-section, which has the largest shape factor, is _____ (Rectangular, I-section, diamond, solid circular).	
	12	The relation between Flexibility (F) and Stiffness (S) is _____	
	13	In the theory of plastic bending of beams, the ratio of the collapse load to the working load is called _____ (Load factor, shape factor, factor of safety, plastic section modulus).	
	14	Spherical dome is obtained by revolution of _____ about its _____ diameter.	
Q.2	**(a)**	State (i) Upper bound theorem and (ii) Lower bound theorems for collapse load in plastic analysis.	**03**
	(b)	Differentiate flexibility and stiffness matrix method of analysis.	**04**
	(c)	Develop Stiffness matrix 'S' for the frame shown in Figure 1.	**07**
		OR	
	(c)	Develop flexibility matrix 'F' for the frame shown in Figure 1. Take reaction at support 'C' as a redundant reaction.	**07**
Q.3	**(a)**	Calculate the shape factor and plastic moment capacity for a square section arranged as diamond shape having size of 150mm and x axis passing through one of the diagonals.	**07**
	(b)	Calculate the collapse load in terms of M_p for the fixed beam subjected to load of 100 kN as a distance of 8m from left end. Length of the beam is 12m.	**07**
		OR	
Q.3	**(a)**	Derive the formula for M_p required for the propped cantilever beam loaded by a collapse uniformly distributed load of W_c kN/m.	**07**

	(b)	Calculate the Mp required for a fixed beam of span 10m and loaded by a collapse uniformly distributed load of 25kN/m over left half 5m.	**07**
Q.4	**(a)**	Define 'dome'. Derive the expression for meridional thrust for a spherical dome subjected to uniformly distributed load.	**07**
	(b)	A spherical dome with a span of 16m and central rise of 4m has all-inclusive load of 12 kN/m^2. Calculate all the stresses at the mid height. Take thickness of dome 120mm.	**07**

OR

Q.4	**(a)**	Derive formula for meridional and hoop force in conical dome subjected to concentrated load 'W' at the vertex, with usual notations.	**07**
	(b)	A conical dome of 12 m diameter with a central rise of 3.5 m supports total uniformly distributed load of 5 kN/m^2 over the surface inclusive of self-weight. Calculate maximum Meridional and hoop force in the dome.	**07**
Q.5	**(a)**	Analyze the continuous beam shown in figure 2 using Flexibility method. Draw shear force and bending moment diagram also. The concentrated loads are acting on mid of the span.	**14**

OR

Q.5	**(a)**	Analyze the continuous beam shown in figure 2 using Stiffness method. Draw shear force and bending moment diagram also. The concentrated loads are acting on mid of the span.	**14**

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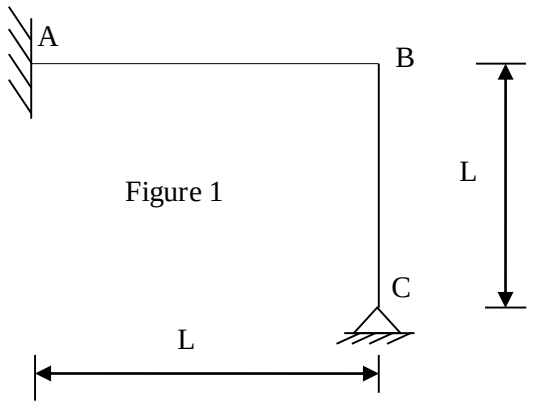

Figure 1

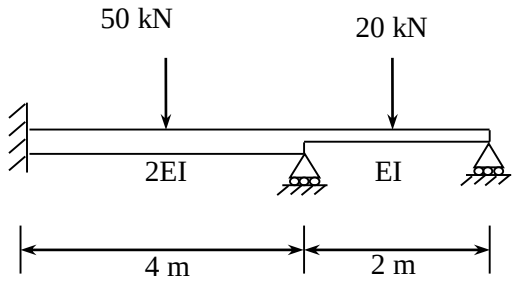

Figure 2