

GUJARAT TECHNOLOGICAL UNIVERSITY**BE – SEMESTER- V EXAMINATION-SUMMER 2023****Subject Code: 150605****Date: 23/06/2023****Subject Name: Structural Analysis - III****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.
4. Simple and non-programmable scientific calculators are allowed.

		Marks
Q.1	(a) Explain the term shape factor and collapse load	03
	(b) Differentiate between straight beam and curved beam.	04
	(c) 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 100 interval.	07
Q.2	(a) State the assumptions of Plastic theory.	03
	(b) Calculate the shape factor for a square section arranged as shown in Figure 1.	04
	(c) Determine the support reactions at C of a frame as shown in figure 2. by flexibility method. Take EI = constant	07
OR		
	(c) Explain type of domes with neat sketches and state their uses.	07
Q.3	(a) Define Released structure and Restrained structure.	03
	(b) Derive the expression for M_{ϕ} for a curved beam fixed at ends.	04
	(c) Formulate the stiffness matrix, S, and load vector, AD-ADL, for the beam shown in the Figure 3. Take EI constant.	07
OR		
Q.3	(a) Give the properties of flexibility and stiffness matrix	03
	(b) Explain the concept of plastic hinge.	04
	(c) Formulate flexibility matrix for a cantilever Non-prismatic beam shown in figure-4.	07
Q.4	(a) List and explain the stresses in spherical dome.	03
	(b) State static and kinematic theorem of plastic analysis.	04
	(c) 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
OR		
Q.4	(a) Derive an expression for stresses in spherical dome subjected to concentrated load at crown.	03
	(b) Differentiate between stiffness method and flexibility method.	04

(c) A spherical dome having 8 m span and 1.5 m rise is subjected to a load of 4 kN/m², 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.5 (a) Find collapse load of fixed beam having length “L” and subjected to point load “W” acting at a distance “a” from left support and distance “b” from right support by static method. **03**

(b) Explain the following matrix equations used in stiffness method. $AD = ADL + S \times D$ **04**

(c) 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**

OR

Q.5 (a) Determine the shape factor for circular section of diameter D. **03**

(b) Derive an expression for Meridional stress develop in a spherical dome subjected to UDL. **04**

(c) Explain with neat sketches the various mechanism of failure of plane frames in plastic analysis. **07**

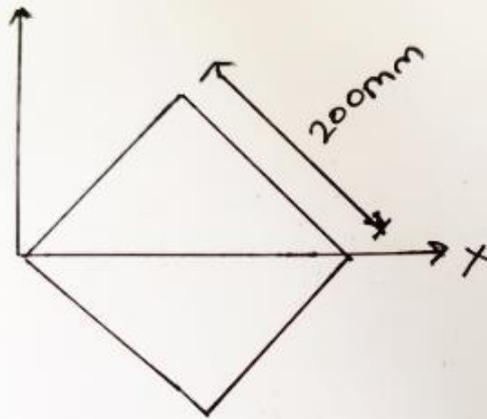


Fig. 1

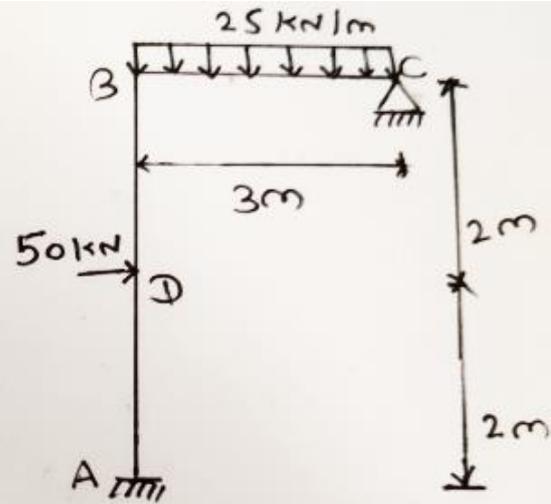


Fig 2

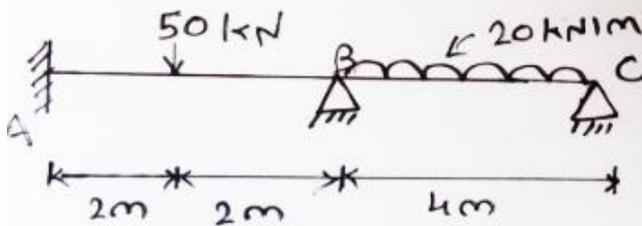


Fig. 3

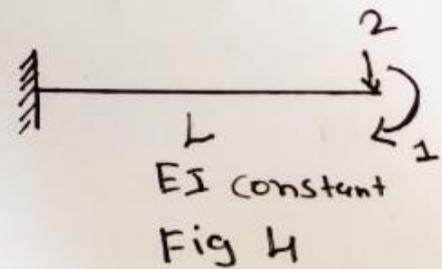


Fig 4