

Seat No.: _____

Enrolment No. _____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER-V (OLD) EXAMINATION – WINTER 2022

Subject Code:150605

Date:23-01-2023

Subject Name:Structural Analysis - III

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.
4. Simple and non-programmable scientific calculators are allowed.

- Q-1** (a) Derive an expression for meridional stress and hoop stress for a spherical dome subjected to UDL. 7
- (b) Derive an expression for M_ϕ and T_ϕ for a curved beam fixed at the ends. 7
- Q-2** (a) Explain type of domes with neat sketches and state their uses. 7
- (b) Explain technical aspects of difference between curved beam and usual beam. 7
- OR**
- (b) Explain torsion factor and list out its value for various shapes of the section for the beams curved in plan. 7
- Q-3** (a) Determine the shape factor for a rectangular beam of width b and depth d . 7
- (b) A fixed beam of 6m span carries a UDL 175 KN/m over the left half of the span. Determine the fully plastic moment for the beam. Also calculate plastic section modulus required. $F_y = 250$ MPa. 7
- OR**
- Q-3** (a) Calculate shape factor for a thin hollow circular section of internal diameter d and external diameter D . 7
- (b) A beam AB of span L fixed at both ends carries a point load W at a distance $L/3$ from the left end shown in figure-1. Find value of the load at collapse condition if the plastic moment of resistance of the left half of the beam is $2M_p$ and the right half has a plastic moment M_p . 7
- Q-4** (a) Differentiate flexibility method and stiffness method of analysis. 7
- (b) Give the essential features of stiffness method. 7
- OR**
- Q-4** (a) Explain actions and displacements in structures with some illustrations. 7
- (b) Give the essential features of flexibility method. 7
- Q-5** (a) For a figure-2 beam show that F and S matrices are reciprocal to each other or prove that $F \times S = \text{Unit matrix}$. 7
- (b) Analyse the frame shown in figure-3 by stiffness method. 7
- Q-5** (a) Formulate flexibility matrix for a cantilever Non-prismatic beam shown in figure-4. 7

(b) Explain the following matrix equations used in stiffness method.

7

$$A_D = A_{DL} + S \times D$$

$$A_R = A_{RL} + A_{RD} \times D$$

$$A_M = A_{ML} + A_{MD} \times D$$

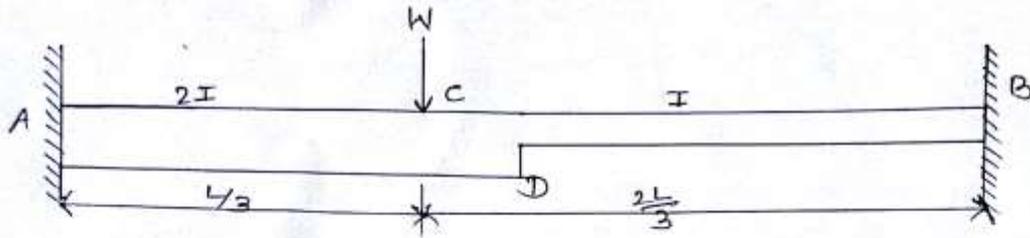


Fig-1 Q-3(b) or

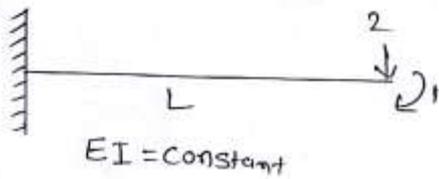


Fig-2 Q-5(a)

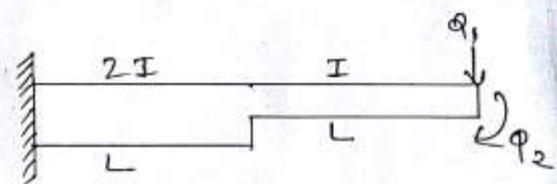


Fig-4 Q-5(a) or

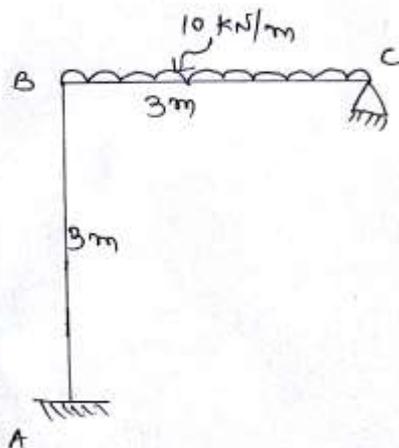


Fig-3 Q-5(b)