

DEPARTMENT OF CIVIL ENGINEERING, IIT DELHI

MINOR EXAM :CVL756 ADVANCED STRUCTURAL ANALYSIS (2024-25)

Venue: LH 310

Alotted time: 90 minutes

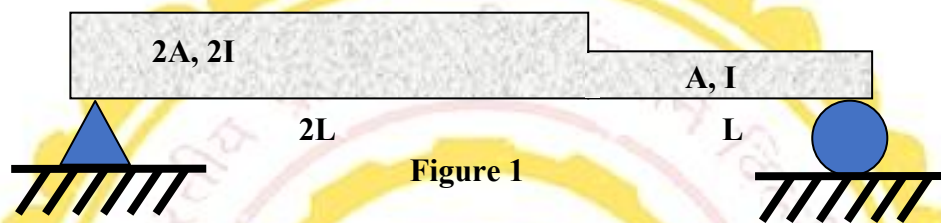
Date: 17 Sep 2024

Max marks : 30

NOTE: (a) All questions are compulsory. (b) Draw neat and clear sketches wherever required.
(c) Assume suitable data if necessary. (d) Assume members as extensible unless otherwise stated.
(e) All answers must be supported by calculations/ justification to secure assigned marks.

Q1.

Determine the flexibility coefficient F_{63} for the **deep beam** shown in Figure 1. The area and the moment of inertia of the two parts of the beam are indicated in the figure.



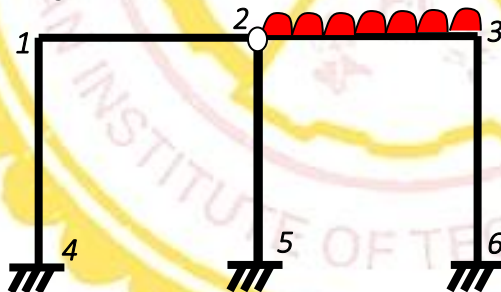
(10 marks)

Q2.

The structure shown in Figure 2 needs to be analyzed using the direct stiffness approach. All members have same length L . For this structure.:

- (a) Label the degrees of freedom
- (b) What shall be the sizes of K_{pp} and K_{xx} ?
- (c) Form the force vector

Clearly state your assumptions and solution approach

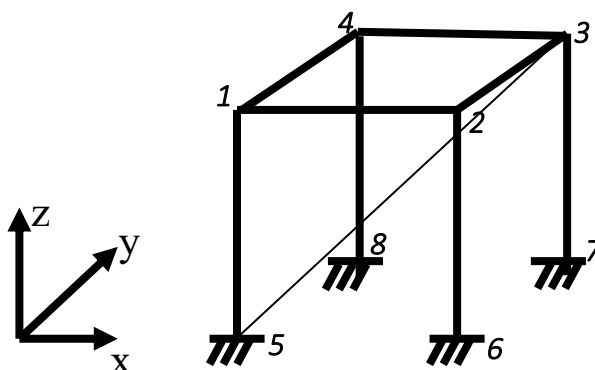


(3+3+4=10 marks)

Q3.

For the structure shown in Figure 3, determine the direction cosines of the local x and y axes of the member spanning between joints "5" and "3"

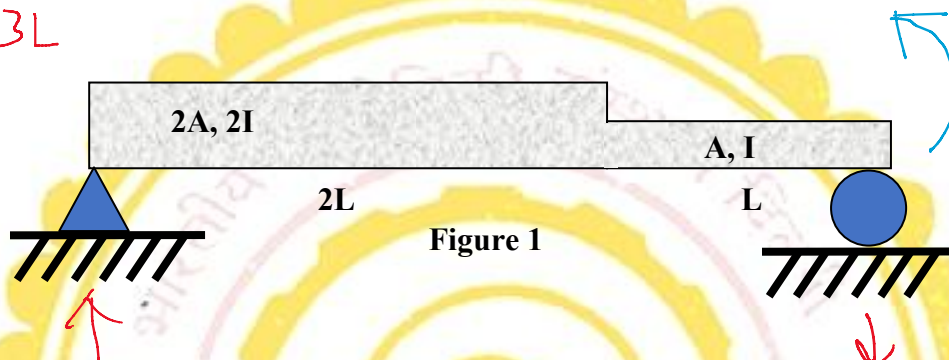
(10 marks)



d



$$V_1 = V_2 = \frac{1}{3L}$$



$$F_{63} = F_{36} = \int_0^{3L} \frac{m_1 m_2}{EI} dx + \int_0^{3L} \frac{V_1 V_2}{AG} dx$$

$$= \frac{-17}{54EI} + \frac{25}{9AGL}$$

4 mks

6 mks

3

3