

DEPARTMENT OF CIVIL ENGINEERING, IIT DELHI

MINOR EXAM: CVL 7411/756 ADVANCED STRUCTURAL ANALYSIS (2025-26)

Venue: LH 526
Date: 15 Sep 2025

Time: 1 hour
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.

Shown in Fig. 1 is the plan layout of a building with rigid slabs. What special considerations are warranted for wind/ seismic analysis? Explain with reasons.

(06 marks)

Q2.

For the structure shown in Figure 2, perform following steps for its analysis using direct stiffness approach (please note that point load is acting at the mid-point of member 3):

- Number all joints and mark the corresponding degrees of freedom, including those corresponding to support reactions.
- Compute the sizes of K_{pp} and K_{xx} and half-band width.
- Form association matrices for members 1, 2 and 3.
- Form the force and the reaction vector.
- Express K_{Ts} (4,6) in terms of the member stiffness matrices of contributing members in global coordinate system.

(1+2+3+3+3=12 marks)

Q3.

Conceptually explain how would you derive K_{22} for a non-prismatic member if you have already derived K_{33} .

(5 marks)

Q4.

Derive the form factor for a thin rectangular pipe section of inner dimensions $2D \times 2D$ and thickness $t \ll D$

(7 marks)

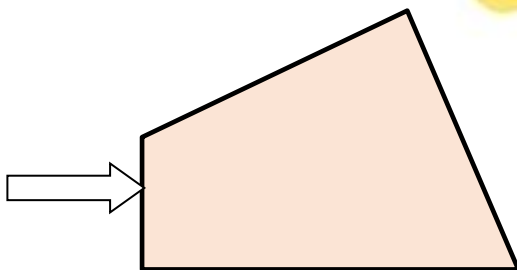


Fig. 1. Layout plan of a building (Q1)

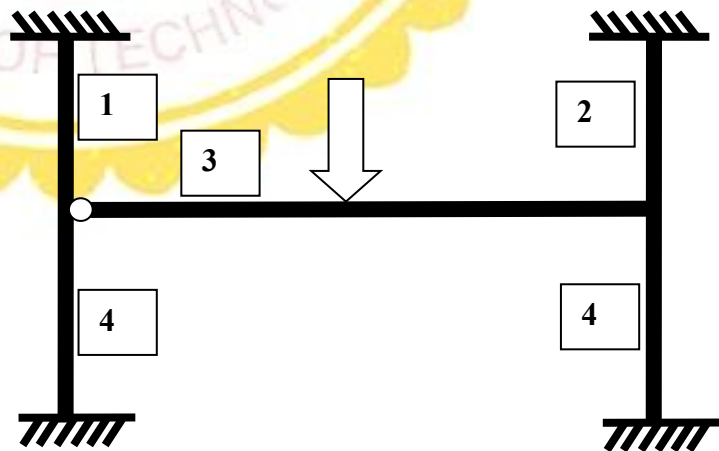


Figure 2 Frame type structure (Q2)