

DEPARTMENT OF CIVIL ENGINEERING, IIT DELHI

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

Time allowed: 120 mins

Date: 20 Nov 2025

Venue: LH

Max marks : 50

NOTE: (a) All questions are compulsory. (b) Draw neat and clear sketches wherever required. (c) Assume suitable data if necessary. (d) Assume members as INEXTENSIBLE unless otherwise stated. (e) All answers must be supported by calculations/ justification to secure assigned marks. (f) This question paper has two printed pages (g) BEGIN ANSWER TO A QUESTION ON A FRESH PAGE

Q1. Distinguish between second order elastic analysis and second order plastic analysis.

(5 marks)

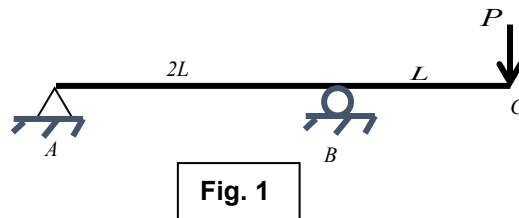
Q2. Mention any three scenarios where the method of substructures would be expedient in the analysis of frame structure.

(5 marks)

Q3.

For the structure shown in Fig. 1, determine the vertical displacement at C using the matrix force method. EI values of each member are same in the figure.

(10 marks)

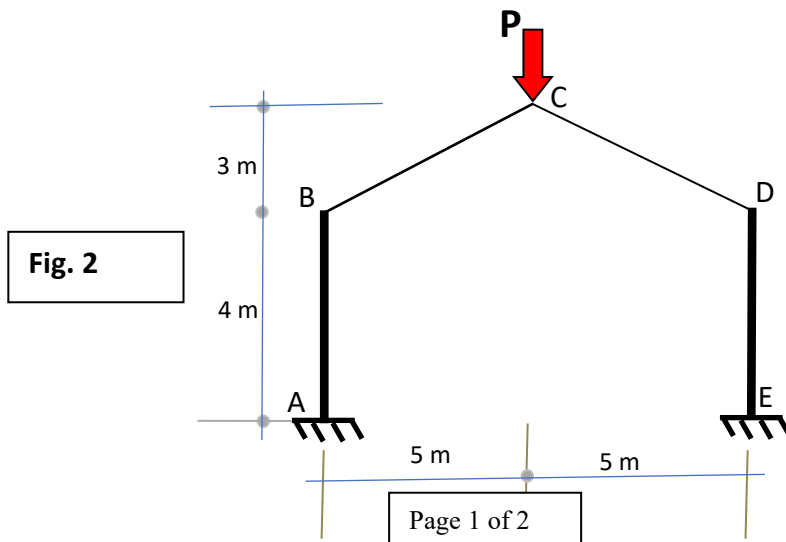


Q4.

The inclined portal frame shown in Fig. 2 has a plastic moment capacity of 300 kNm for columns and 200 kNm for beams. For this structure:

- Which mechanisms are not possible at all? Establish it logically or mathematically.
- Draw the beam-column and combined mechanisms.
- Determine the failure load for the combined mechanism.
- Perform yield check at joint B and comment on the result.

(3+3+10+4 = 20 marks)



Q5. For the structure shown in Fig.3, having rigid floor slabs at two levels, perform the following:

- Label all the degrees of freedom
- Determine the sizes of K_{JJ} and K_{FF} .
- Explain the computational process of condensation as applied to the structure.
- Determine half band width of K_{JJ} .
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(2+2+4+2 = 10 marks)

