

DEPARTMENT OF CIVIL ENGINEERING, IIT DELHI

MAJOR : CVL 756 ADVANCED STRUCTURAL ANALYSIS (2019-20)

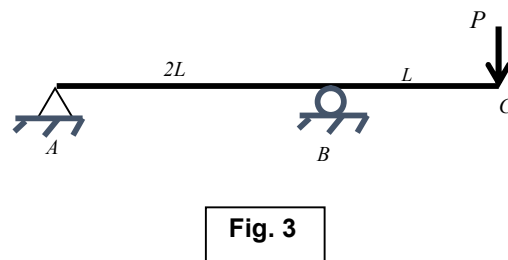
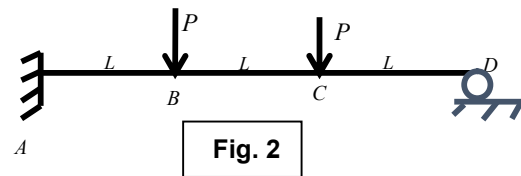
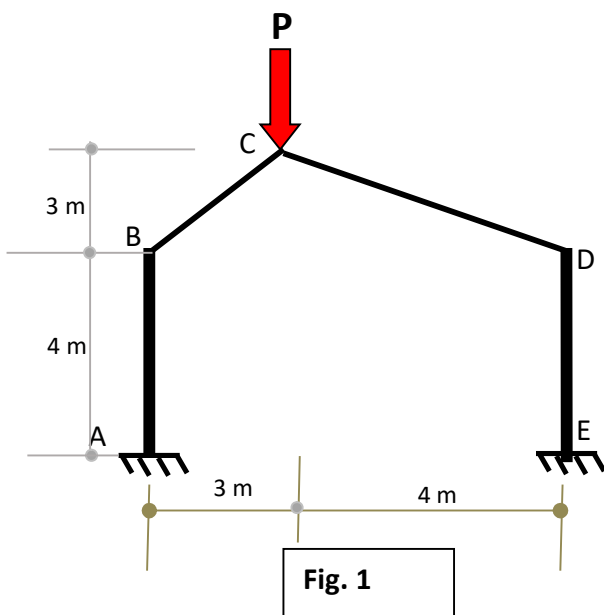
Time allowed: 2 hours (10:30am-12:30pm)

Date: 21 Nov 2019

Venue: LH 408

Max marks : 40

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. The inclined frame structure shown in Fig. 1 has a plastic moment capacity of 200 kNm for beams and 400 kNm for columns. For this structure:

- Draw all possible mechanisms
- Determine the failure load of the mechanism where plastic hinges appear at all joints except B

(3+10 = 13 marks)

Q2. Can the structure shown in Fig. 2 develop hinges under both the loading points, i.e. B and C? Employ Yield criteria in support of your answer.

(5 marks)

Q3. Determine the rotation at point B for the beam structure shown in Fig. 3 using matrix flexibility method. Assume all members to have same value of EI.

(5 marks)

Q4. Determine an expression for twist of a plate with respect to a plane nt oriented at an angle α with respect to xy plane.

(4 marks)

Q5. Explain what mathematical transformations are needed for a beam element of a 3D space frame structure with rigid slab so as to achieve desired behaviour.

(4 marks)

Q6. Determine bandwidth for a ten storeyed 3D space frame (without slabs) having five bays in each horizontal direction assuming that the design engineer follows a joint numbering sequence horizontally.

(4 marks)

Q7. What additional considerations are needed for carrying out the structural analysis of a 3D frame structure under gravity loads using plane frame analysis?

(3 marks)

Q8. State any two drawbacks of matrix flexibility approach vis-à-vis the direct stiffness approach.

(2 marks)