

**MINOR 2 :CVL756**  
**ADVANCED STRUCTURAL ANALYSIS (2018-19)**

Time allowed: 1hour

Date: 06 October 2018

Venue: LH 510

Max marks : 20

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.

**Q1.** Determine the ultimate failure load “P” for the structure shown in Figure 1. Verify that the critical mechanism is satisfying yield criteria.

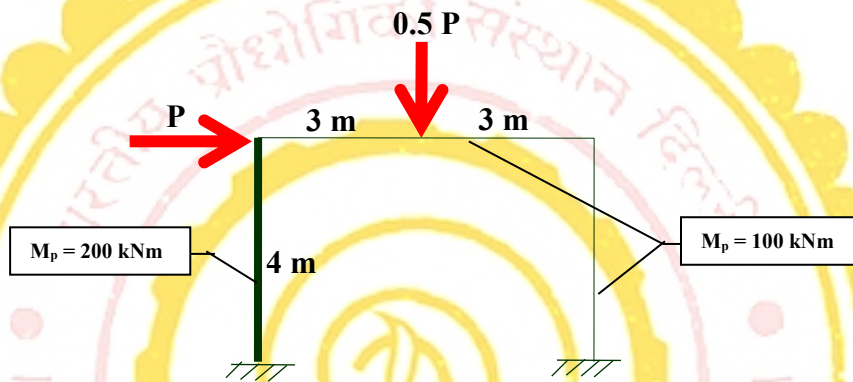


Figure 1

(8 marks)

**Q2.** For a rectangular beam undergoing plastification, determine the curvature (in terms of curvature at yield point) when external moment reaches 90% of the plastic moment capacity.

(3 marks)

**Q3.** What equilibrium and compatibility conditions need to be considered while analyzing a problematic structure using the method of substructures?

(2 marks)

**Q4.** Figure 2 shows a three storeyed space frame structure (plan dimensions 4x12 m) with floor slabs to be analysed using direct stiffness method. All beams and columns have identical cross-sections. The user has given hint on joint numbering sequence (All floor/ joint numbering should commence from top). For this structure, answer the following points:

- Under what circumstances do we need to include rigid diaphragm action of floor slab in the analysis.
- Specify the size of  $K_{pp}$  for the two scenarios: (a) Normal 3D analysis (b) 3D analysis with rigid diaphragm action of floor slabs.
- Association matrix of the member marked with "\*" for the two analysis types (a) and (b) indicated in part (ii)
- If a force of 100 kN is acting at joint 2 in "X" direction, obtain the load vector of the structure corresponding to floor degrees of freedom for analysis type (b). Assume the origin of the coordinate system to be located at the centroid of the plan.

(1+1+3+2=7 marks)

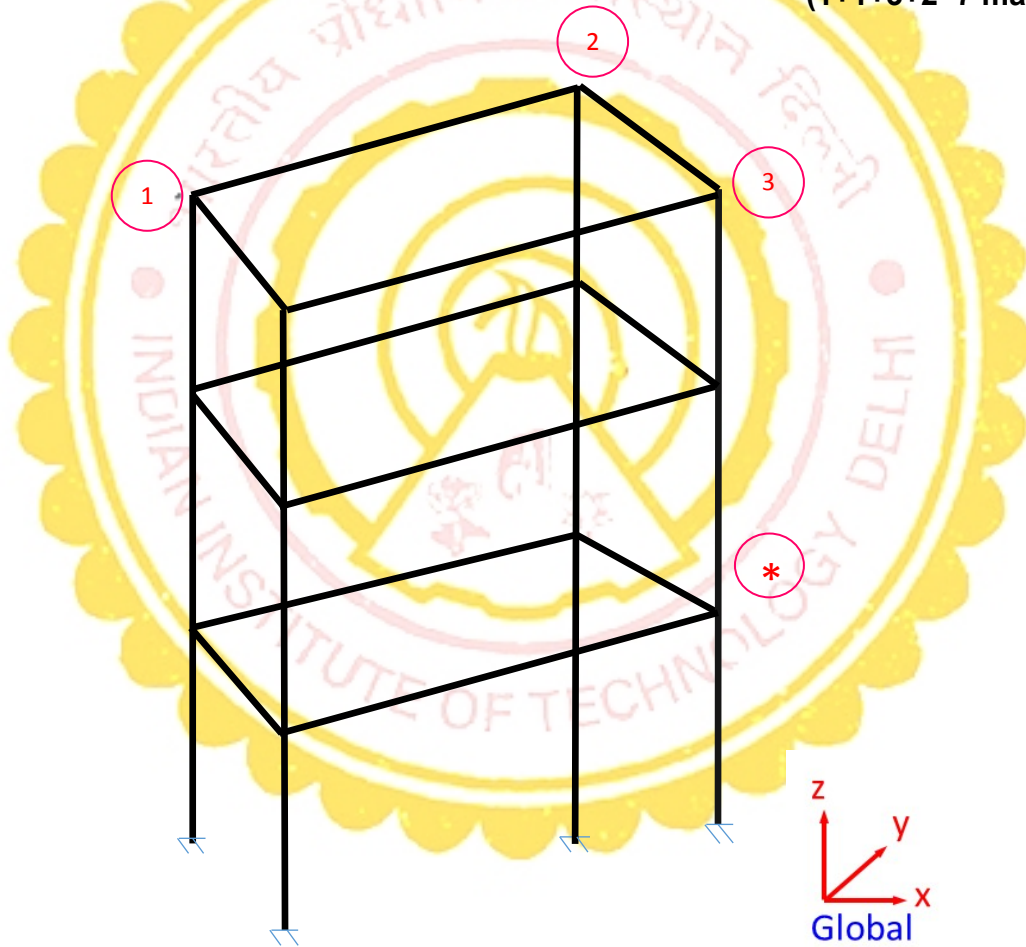


Figure 2