

DEPARTMENT OF CIVIL ENGINEERING, IIT DELHI

MAJOR : CVL 756 ADVANCED STRUCTURAL ANALYSIS (2016-17)

Time allowed: 2 hours

Date: 24 Nov 2016

Venue: IV LT 3

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 extensible unless otherwise stated.
(e) All answers must be supported by calculations/ justification to secure assigned marks.
(f) This question paper has two printed pages

- Q1.** (a) Explain how is a “tier building” different from a normal 3D frame?
(b) How can the effect of a rigid floor slab be simulated in a software capable of general 3D frame analysis but does not take into account the presence of rigid slab
- (2.5+2.5 = 5 marks)**
- Q2.** (a) Derive an expression for curvature in any general direction for a thin plate.
(b) Derive an expression for twisting moment M_{xy} for a thin plate. Show positive directions of the moment on a small plate element.
- (3+3 = 6 marks)**
- Q3.** For the structure shown in Figure 1, clearly show all possible failure mechanisms. Obtain the ultimate failure loads of each mechanism and carry out yield check for the most critical mechanism. All members have a plastic moment capacity of M_p .
Note: Please show all intermediate steps including geometrical formulations while arriving at the mechanisms and the corresponding loads
- (15 marks)**
- Q4.** Using general DOF notation, derive the element K_{33} for the non-prismatic member shown in Fig. 2. Assume the variation of I to take place linearly.
- (8 marks)**
- Q5.** Explain how the inverse of K_{JJ} can be obtained easily using Cholesky’s algorithm for a 3D building frame with rigid diaphragm.
- (3 marks)**
- Q5.** Obtain the location of plastic neutral axis for an equilateral triangular section of each side “a”.
- (3 marks)**

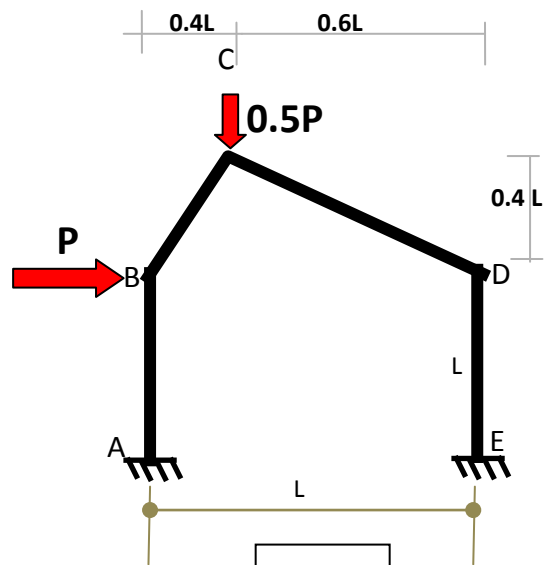


Fig. 1

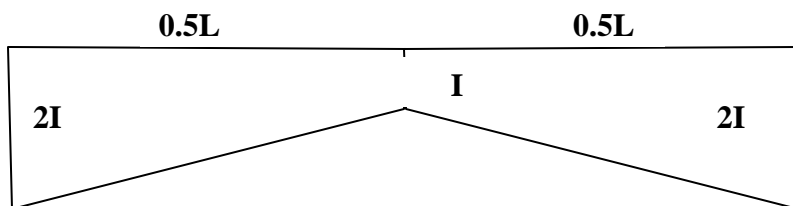


Fig. 2