Prince of Songkla University

Faculty of Engineering

Final Examination: Semester II — Academic Year 2008

Sunday, February 22, 2009 — Time 13:30-16:30

220-506 Stability of Structures — Room: A201

Instructions.

1. There are 3 questions with equal marks.
2. Attempt all questions.
3. Books and notes are allowed.
4. Pencils are recommended to be used in answering the questions.

Instructor : Fukit Nilrat

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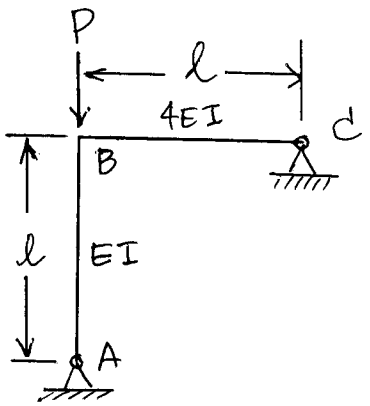
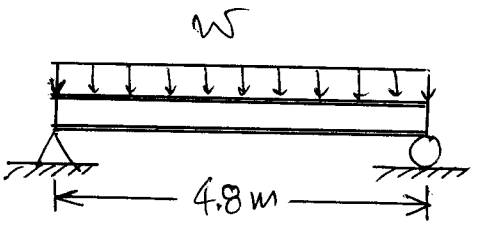
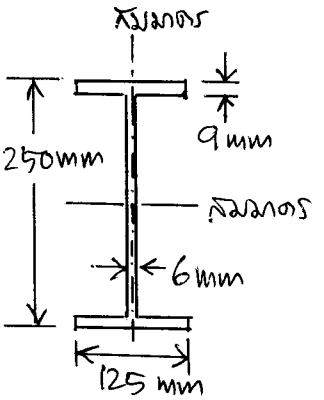
1. Find the critical load P_{cr} of the frame shown using the matrix stiffness method by assuming that all members are inextensible. Note that the flexural stiffness of the beam BC is four times of the column AB.



2. A simply supported steel 250x125 mm H-beam is subjected to uniformly distributed load w at the top flange of the beam as shown. The beam span is 4.8 m and there is no lateral bracing between the two supports. Determine the critical point load w_{cr} in kg/m corresponding to the elastic lateral torsional buckling of the beam. Neglect the weight of the beam. Assuming that for the steel beam, E = $2x10^6$ ksc and G = $800x10^6$ ksc.





Cross section

3. A cantilever column is subjected to an axial load P as shown in Figure (a). In using the Rayleigh-Ritz method by assuming that the lateral displacement v in the y-direction for the buckling shape of the column is similar to the lateral displacement of the column subjected to a lateral point load Q as shown in Figure (b).

   (i) Determine the lateral displacement v of the column shown in Figure (b).

   (ii) Determine the approximate elastic buckling load P_{cr} by the Rayleigh-Ritz method and compare the obtained critical load to the ~~Euler~~ Exact buckling load.

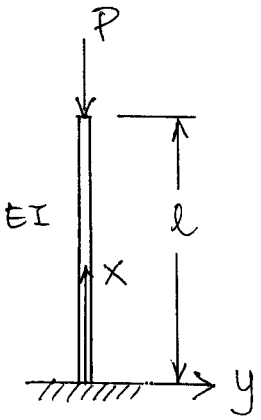


Figure (a)

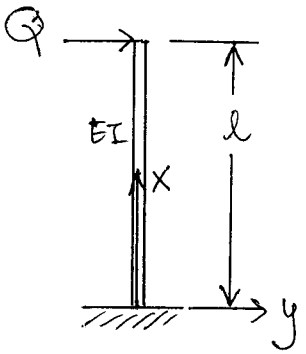


Figure (b)