

Prince of Songkla University

Faculty of Engineering

Final Examination: Semester I

Monday, October 10, 2005

220-506 Stability of Structures

Academic Year 2005

Time 9:00-12:00

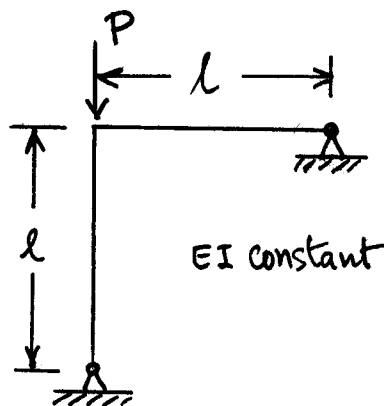
Room R300

Instructions.

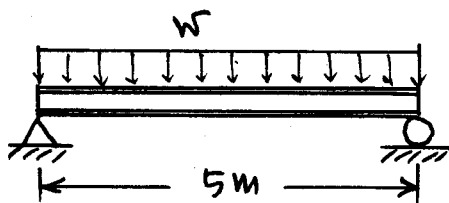
1. There are 3 questions with equal marks.
2. Attempt all questions.
3. Books and notes are allowed.
4. Pencils are recommended to be used in answering the questions.

Instructor : Fukit Nilrat

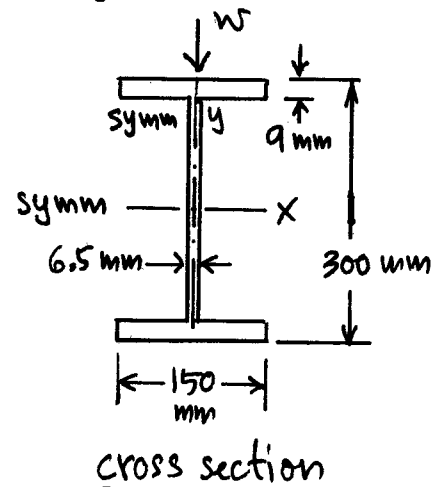
1. Find the critical load P_{cr} of the frame shown using the matrix stiffness method by assuming that all members are inextensible.



2. A simply supported steel 300x150 mm H-beam is subjected to uniformly distributed load w at the top flange of the beam as shown. The beam span is 5 m and there is no lateral bracing between the two supports. Determine the critical uniform load w_{cr} in kg/m corresponding to the elastic lateral torsional buckling of the beam.



$$I_x = 7210 \text{ cm}^4, I_y = 508 \text{ cm}^4$$
$$E = 2 \times 10^6 \text{ ksc}, G = 800 \times 10^3 \text{ ksc}$$



3. A hinged-hinged column is subjected to an axial load P as shown. By using the Rayleigh-Ritz method and assuming that the lateral displacement v in the y -direction for $0 \leq x \leq l/2$ is $v = a_1x^2 + a_2x^3$, determine the approximate elastic buckling load P_{cr} and compare the obtained critical load to the Euler buckling load ($\pi^2 EI/l^2$). (Since the problem is symmetrical, the integration from 0 to l is equal to twice of the integration from 0 to $l/2$.)

