

國立成功大學

113學年度碩士班招生考試試題

編 號： 129

系 所： 航空太空工程學系

科 目： 材料力學

日 期： 0201

節 次： 第 1 節

備 註： 不可使用計算機

※ 考生請注意：本試題不可使用計算機。請於答案卷(卡)作答，於本試題紙上作答者，不予計分。

1. (20%) A rectangular block, which is part of a cantilever beam, has a negligible weight and is subjected to a vertical force P (axial load with eccentricity e_y), as shown in Figure 1. Determine the range of values for the eccentricity e_y so that it does not cause any tensile stress in the block.

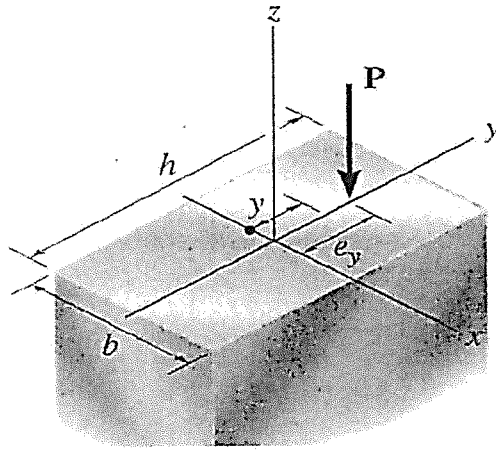


Figure 1

2. (30%) Consider a cantilever beam with uniform EI and an additional spring support as shown in Figure 2.

- Analyze the statical (in)determinacy of the system.
- Find the beam deflection at end B .
- Find all the support reactions as $k \rightarrow \infty$.
- Find the beam slope at end B as $k \rightarrow \infty$.

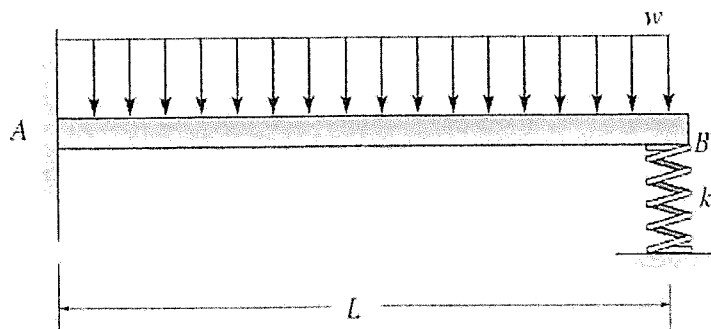


Figure 2

3. (25%) The beam ABD shown in Figure 3a has simple supports at A and B and an overhang from B to D . The beam has a rectangular cross section as shown in Figure 3b, with $b = 60$ mm, and $h = 100$ mm.

(a) Determine the maximum tensile and compressive stresses in the beam due to the uniform load.

(b) Determine the maximum shear stress in the beam.

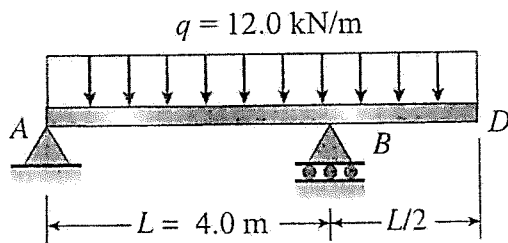


Figure 3a

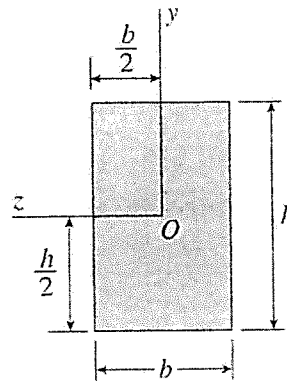


Figure 3b

4. (25%) Consider an ideal column that is fixed at the base, free at the top, and subjected to an axial load P , as shown in Figure 4. The column is uniform and of bending rigidity EI .

(a) Derive the buckling equation for the critical load P_{cr} of the column.

(b) Find the critical loads and the buckled mode shapes.

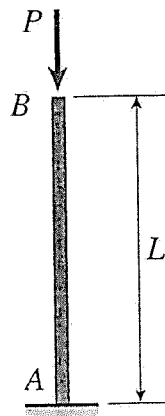


Figure 4