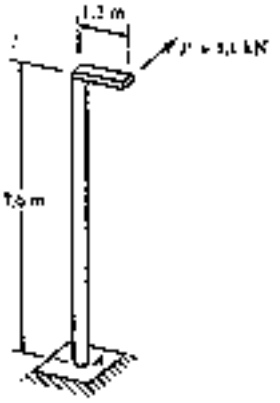
1. A post having a hollow circular cross section supports a horizontal load P=1.1 kN acting at the end of a 1.2 m long arm (see Figure 1). The height of the post is 7.6 m and its section modulus is S=164 cm^3. 35%

(a) Construct shear-force and bending-moment diagrams for the post.

(b) Calculate the maximum tensile stress σ_{max} and maximum shear stress τ_{max} at point A due to the load P. Point A is located where the normal stress due to bending alone is a maximum.

(c) If the maximum tensile stress and the maximum shear stress at point A are limited to 110 Mpa and 40 Mpa, respectively, what is the largest permissible value of the load P?

(d) Locate the shear center S of the hollow circular section.

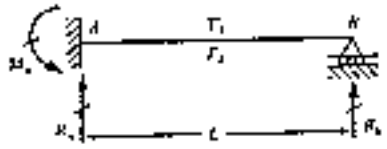


2. A propped cantilever beam, fixed at the left end A and simply supported at the right end B, has temperature T_1 on its upper surface and T_2 on its lower surface (see Figure 2). 35%

(a) Find the reactions for the beam.

(b) Find the maximum deflection of the beam.

(註: 如果不知道如何處理溫度效應的問題，可以考慮處理下列問題：
以均佈荷重q_1, q_2分別取代溫度T_1, T_2，但得分最高僅20分。)



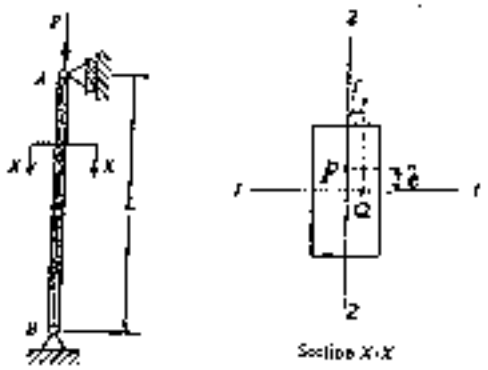
(背面仍有題目,請繼續作答)

3. A long slender column AB is pinned at ends A and B and compressed by an axial force P (see Figure 3). Assume that the load P is applied with a small eccentricity e from the axis 1-1. 25%

(a) Determine the maximum deflection of the column.

(b) If we now have another compressive force Q applied with a small eccentricity f from the axis 2-2, determine the maximum deflection of the column. (Note that load P is still on the column.)

(c) Use the results of (a) and/or (b) to determine the critical buckling load P_{cr} when the axial force P acted at the centroid of the cross section.



4. (a) Describe the basic assumptions of the classical beam theory and the physical meaning of those assumptions. 25%

(b) Are there any shear stresses and/or strains in analyzing a beam subjected to bending forces using the classical beam theory? Why?

(c) Are there any normal stresses and/or strains in analyzing a beam subjected to bending forces using the classical beam theory? Why?

(d) In the uni-axial tension test, a stress-strain curve can be constructed. Based on the curve, please use several words to define the proportional limits, yield point, ultimate strength, and fracture point.