

系所組別： 土木工程學系甲、丙、丁組

考試科目： 材料力學

考試日期： 0307， 節次： 1

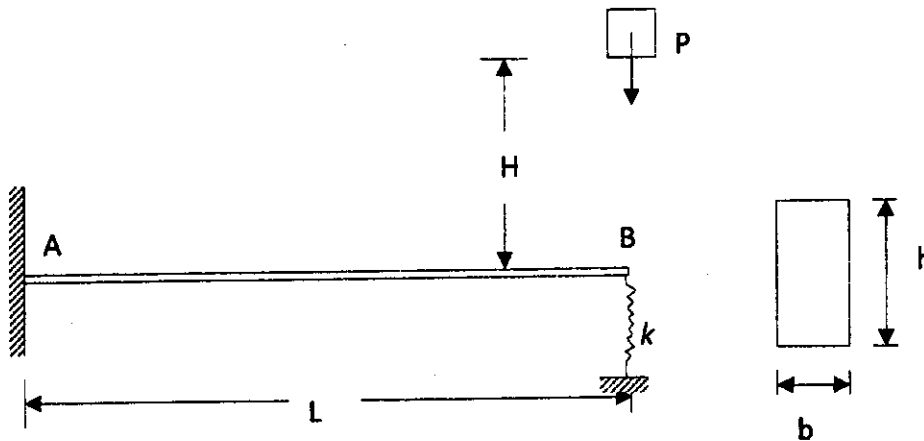
※ 考生請注意：本試題 可 不可 使用計算機

1. Make the reasonable assumptions; derive the flexure formula of beam.

$$\sigma = \frac{My}{I}$$

where σ = bending stress, M = bending moment, I = moment of inertia, and y = distance from the neutral axis. (20%)

2. A cantilever beam AB with a spring at the end B, its cross section is rectangular with width b and height h . The elastic modulus of beam material is E , stiffness of spring is k . This beam is struck at its end B by a falling body of weight P from height H . Find
- (1) the fore of spring (10%),
 - (2) the maximum dynamic deflection (10%),
 - (3) the maximum dynamic normal stress (10%).



(背面仍有題目,請繼續作答)

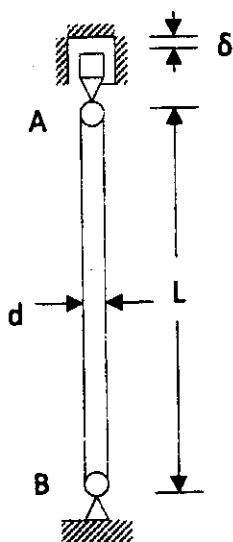
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3. A simply supported slender circular bar AB with length $L = 1\text{ m}$, diameter $d = 16\text{ mm}$. This bar is installed at 20°C . After installation, there is a small gap $\delta = 0.25\text{ mm}$ at point A. Assume the factor of safety $n = 2.5$, the elastic modulus of material $E = 200\text{ GPa}$, yield stress $\sigma_s = 200\text{ MPa}$, and the coefficient of thermal expansion $\alpha = 11.2 \times 10^{-6}/^\circ\text{C}$. If the temperature rises uniformly, find the maximum allowable temperature of this bar. (25%)



4. A circular bar subjected to an axial tension F and a torque T . At the surface point C, the strain at angle 45° with respect to the longitudinal axis is $\epsilon_{45^\circ} = -2.24 \times 10^{-4}$. The diameter $d = 200\text{ mm}$, elastic modulus of material $E = 200\text{ GPa}$, Poisson's ratio $\nu = 0.28$, and axial tension $F = 251\text{ kN}$. Find the magnitude of T . (25%)

