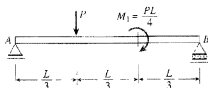
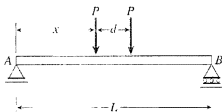


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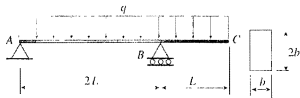
- (1) (15%) The simple beam AB shown in the following figure is subjected to a concentrated load P and a couple $M_1 = (PL/4)$ acting at the positions indicated. Draw the shear-force and bending moment diagrams for this beam.



- (2) (15%) Two equal loads P are separated by a fixed distance d (see the following figure). This load combination may be positioned at any distance x from the left-hand support of the simple beam AB. (a) For what distances x will the shear force in the beam be a maximum? What is the maximum shear force V_{max} ? (b) Derive a formula for the distance x that will produce the maximum bending moment M_{max} in the beam. Also obtain an expression for M_{max} .



- (3) (20%) A steel beam ABC is simply supported at A and B and has an overhang BC of length $L = 150$ mm (see the following figure). The beam supports a uniform load of intensity $q = 3.5$ kN/m over its entire length of 450 mm. The cross section of the beam is rectangular with width b and height $2b$. The allowable bending stress in the steel is $\sigma_{allow} = 60$ MPa and its weight density is $\gamma = 77.0$ kN/m³. (a) Disregarding the weight of the beam, calculate the required width b of the rectangular cross section. (b) Taking into account the weight of the beam, calculate the required width b .



(背面仍有題目,請繼續作答)

系所組別 航空太空工程學系乙組

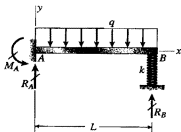
考試科目：材料力學

考試日期：0307，節次：1

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(4) (25%) A cantilever beam AB of length L has a fixed support at A and a linear-spring support at B (as shown below). If a uniform load of intensity q acts on the beam,

- (a) what is the displacement δ_B of end B of the beam? and
 (b) what is the angle of rotation θ_B of end B of the beam, when the stiffness of the spring is infinite, i.e., $k \rightarrow \infty$?
 (c) Find all the support reactions when $k \rightarrow \infty$.



(5) (25%) Consider a column that is fixed at the base and pinned at the top (as shown below). It is uniform and of bending stiffness EI .

- (a) Derive the buckling equation for the buckling load P_{cr} of the system.
 (b) Estimate the buckling load P_{cr} by using the concept of effective length.

