

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

※ 考生請注意：本試題 可 不可 使用計算機

1. (25%) A bar of rectangular cross section is subjected to an axial load P (Figure 1). The bar has width $b = 60$ mm and thickness $t = 10$ mm. A hole of diameter d is drilled through the bar to provide for a pin support. The allowable *tensile* stress in the bar is 140 MPa, and the allowable *shear* stress in the pin is 80 MPa. The allowable *bearing* stress between the pin and the bar is 200 MPa.
- (a) Given the pin diameter $d = 10$ mm, determine the allowable load P_{allow} .
- (b) Determine the pin diameter d_m for which the load P will be a *maximum*.

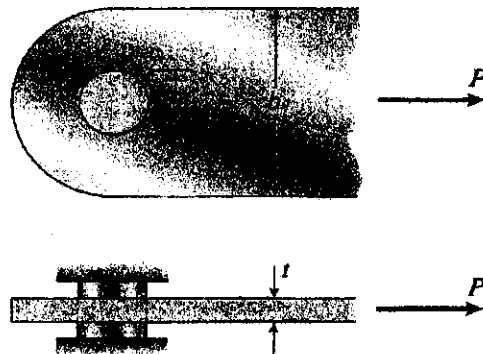


Figure 1

2. (25%) A laminated plastic beam of square cross section is built up by gluing together three strips, each 10 mm×30 mm in cross section (Figure 2). The beam has a total weight of 3.2 N (distributed as q) and is simply supported with span length $L = 320$ mm.
- (a) Considering the weight of the beam and a load P acting at the midpoint, draw the shear-force and bending-moment diagrams for this beam.
- (b) Calculate the maximum permissible load P that may be placed at the midpoint if the allowable shear stress in the glued joints is 0.4 MPa, and the allowable shear stress and bending stress in the plastic is 0.3 MPa and 8 MPa, respectively.

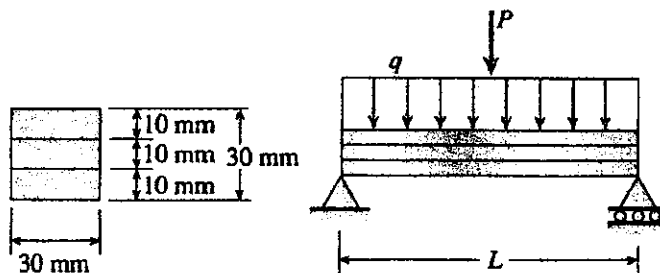


Figure 2

(背面仍有題目,請繼續作答)

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3. (25%) A uniform load of intensity p is acting on the beam of flexural rigidity EI as shown in Figure 3. By solving the beam equation, determine the equation of the deflection curve and the reactions at A and B for the beam. The beam equation is given as $EI \frac{d^4 y}{dx^4} = p$ or $EI \frac{d^2 y}{dx^2} = -M$. (Do NOT use the method of superposition)

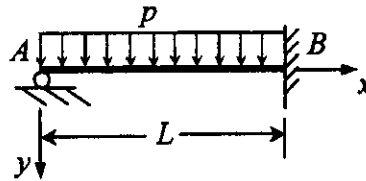


Figure 3

4. (25%) For the ideal column shown in Figure 4, determine (a) the critical load P_{cr} , (b) the equation of the buckled shape. (Hint: assume that the deflection at the free end of the column is δ .)

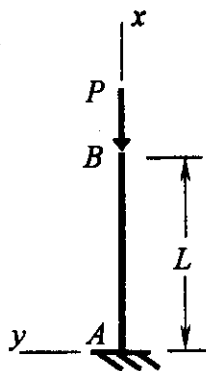


Figure 4