

※ 考生請注意：本試題不可使用計算機

- Three round bars having the same length  $L$  but different shapes are shown in Fig. 1. The first bar has diameter  $d$  over its entire length, the second has diameter  $d$  over one-fifth of its length, and the third has diameter  $d$  over one-fifteenth of its length. Elsewhere, the second and third bars have diameter  $2d$ . All three bars are subjected to the same axial load  $P$ .  
Compare the amounts of strain energy stored in the bars, assuming linearly elastic behavior. Disregard the effects of stress concentrations and the weights of the bars. (25%)
- A beam ABC with an overhang at the left-hand end is shown in Fig. 2. The beam is subjected to a uniform load of intensity  $q=1.0$  k/ft on the overhang AB and a counterclockwise couple  $M_0=12.0$  k-ft acting midway between the supports at B and C. Construct shear-force and bending-moment diagrams for this beam. (25%)
- The composite beam shown in Fig. 3 is formed of a wood beam (4.0 in.  $\times$  6.0 in. actual dimensions) and a steel reinforcing plate (4.0 in. wide and 0.5 in. thick). The beam is subjected to a positive bending moment  $M = 60$  k-in. Using the transformed-section method, calculate the largest tensile and compressive stresses in the wood (material 1) and the maximum and minimum stresses in the steel (material 2) if  $E_1 = 1500$  ksi and  $E_2 = 30,000$  ksi. (25%)
- A cantilever beam ACB with two different moments of inertia supports a concentrated load  $P$  at the free end A (Fig.4 a and b). Determine the deflection  $\delta_A$  at the free end. (25%)

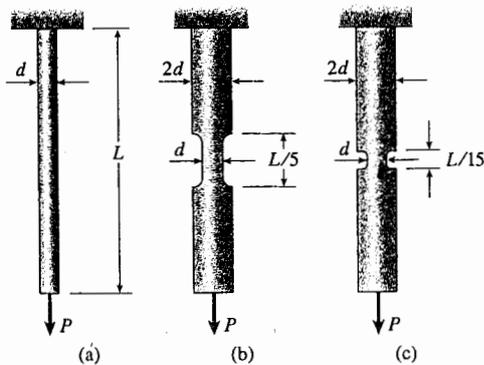


Fig. 1

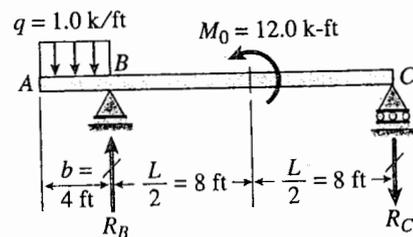


Fig. 2

(背面仍有題目,請繼續作答)

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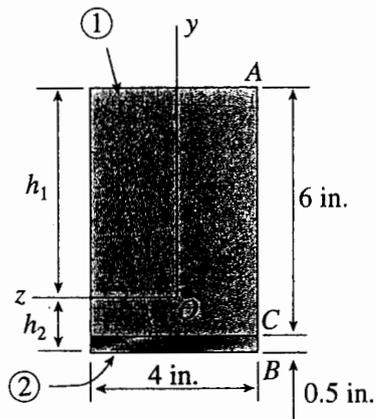


Fig. 3

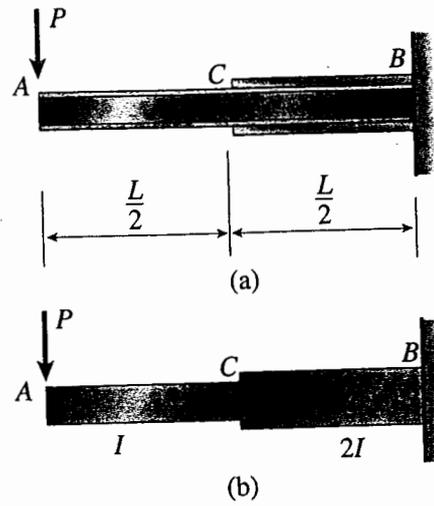


Fig. 4