

※ 注意：全部題目均請作答於試卷內之「非選擇題作答區」，請標明題號依序作答。

1. (20 Points) Multiple-choice questions

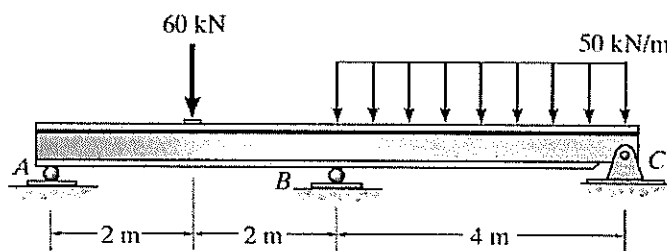
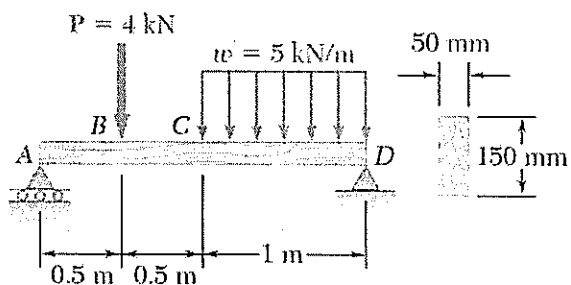
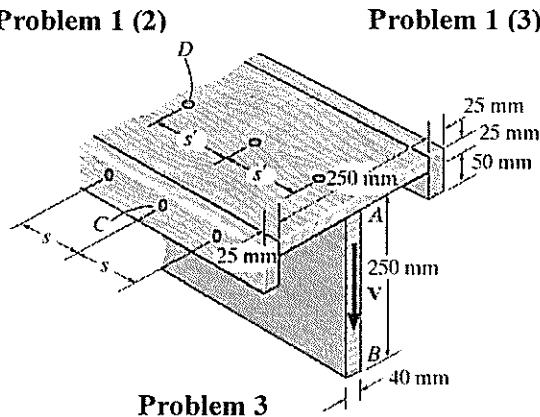
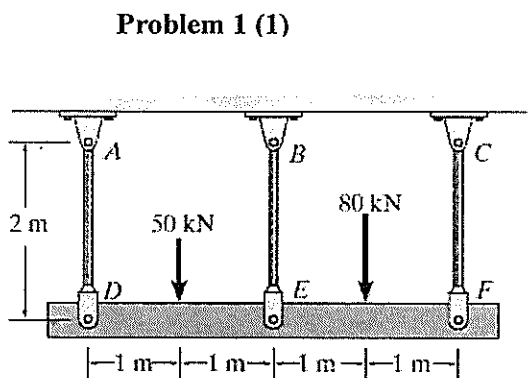
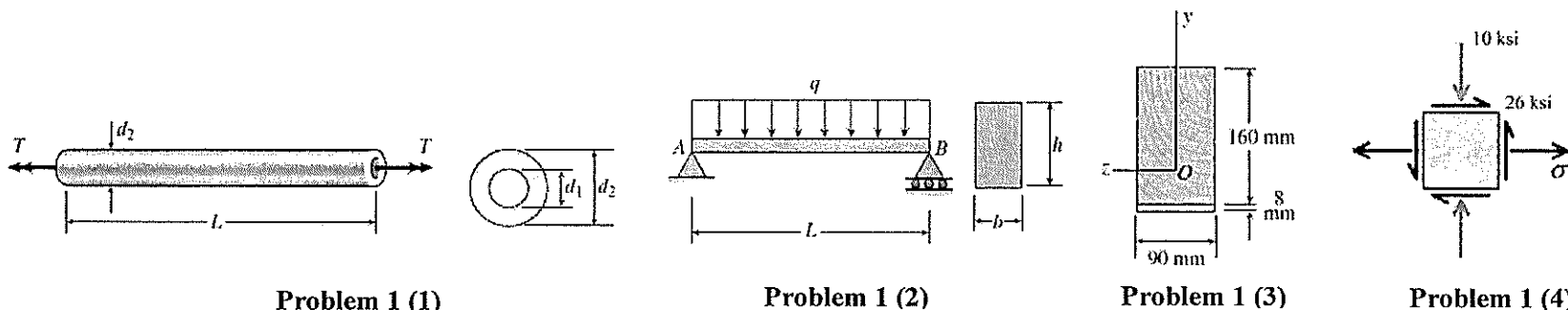
- (1) A hollow aluminum shaft ($G = 27 \text{ GPa}$, $d_2 = 96 \text{ mm}$, $d_1 = 52 \text{ mm}$) has an angle of twist per unit length of $1.8^\circ/\text{m}$ due to torques T . The resulting maximum tensile stress in the shaft is approximately: (A) 38 (B) 41 (C) 49 (D) 58 MPa
- (2) A simply supported wood beam ($L = 5 \text{ m}$) with rectangular cross section ($b = 200 \text{ mm}$, $h = 280 \text{ mm}$) carries uniform load $q = 6.5 \text{ kN/m}$ that includes the weight of the beam. The maximum flexural stress is approximately: (A) 8.7 (B) 10.1 (C) 11.4 (D) 14.3 MPa
- (3) A composite beam is made up of a $90 \text{ mm} \times 160 \text{ mm}$ wood beam ($E_w = 11 \text{ GPa}$) and a steel bottom cover plate ($90 \text{ mm} \times 8 \text{ mm}$, $E_s = 190 \text{ GPa}$). Allowable stresses in wood and steel are 6.5 MPa and 110 MPa , respectively. The allowable bending moment about the z -axis of the composite beam is most nearly: (A) 2.9 (B) 3.5 (C) 4.3 (D) 9.9 $\text{kN} \cdot \text{m}$
- (4) Consider a point in a structural member that is subjected to plane stress. Normal and shear stresses acting on horizontal and vertical planes at the point are shown. If $\sigma = 15 \text{ ksi}$, determine the angle θ_s corresponding to the orientation of the maximum in-plane shear stress. (A) 56.7° or -33.3° (B) 66.7° or -23.3° (C) 60.7° or -29.3° (D) 77.2° or -12.8°

2. (18 Points) The three suspender bars are made of A992 steel and have equal cross-sectional areas of 450 mm^2 . Determine the average normal stress in bar AD , BE , and CF if the rigid beam is subjected to the loading shown.

3. (18 Points) The beam is made from four boards nailed together as shown. If the nails can each support a shear force of 500 N , determine their required spacing s and s' if the beam is subjected to a shear of $V = 3.5 \text{ kN}$.

4. (24 Points) For the timber beam and loading shown, determine (a) the slope at end A , (b) the deflection at the midpoint C , (c) the magnitude and location of the largest downward deflection. Use $E = 12 \text{ GPa}$.

5. (20 Points) Determine the reactions at the supports A , B , and C , then draw the shear and moment diagrams. EI is constant.



Problem 2

Problem 3

Problem 4

Problem 5

試題隨卷繳回