

科目：材料力學

適用：土木系(結構與應力組)

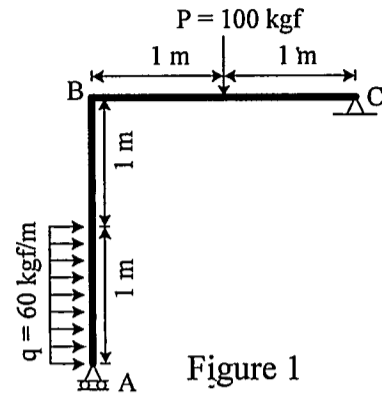
考生注意：

1. 依次序作答，只要標明題號，不必抄題。
2. 答案必須寫在答案卷上，否則不予計分。
3. 限用藍、黑色筆作答；試題須隨卷繳回。

本試題
共壹頁
第壹頁

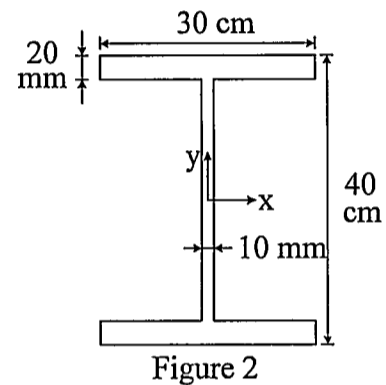
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1. (25%) A steel frame is respectively supported by a roller and a hinge at A and C. Components AB and BC are rigidly connected at B. The lengths of AB and BC, and the forces loaded on the two components are shown as Figure 1. Sketch the axial force, shear force, and bending moment diagrams of the frame.

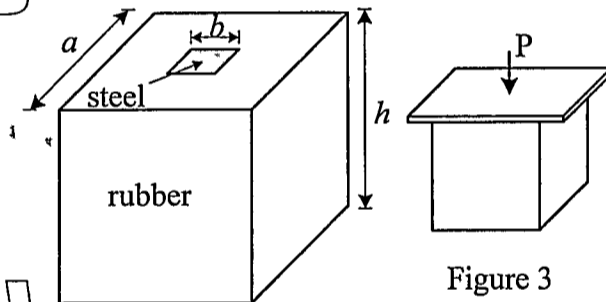


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2. An H-section beam is made of steel with a cross section as shown in Figure 2. A coordinate system is chosen at the center of the section.
- (a) (12%) Calculate the moment of inertia of the section about the x-axis.
- (b) (13%) If the section is subjected to a bending moment about x-axis with a magnitude of $2362.4 \text{ ton}\cdot\text{cm}$, calculate the maximum normal stress at the section.



3. (25%) A composite support is made of a square hollow rubber tube with a square steel rod filled inside the tube. The side lengths of the rubber and steel are respectively a and b , and the Young's moduli of the two materials are respectively E_r and E_s . A steel plate is placed on the top of the support, and an axial force P is loaded on the center of the plate.



The two materials together bear the force P : $P = P_r + P_s$, where P_r and P_s are the forces shared by the rubber tube and steel rod, respectively. The two materials must deform following the requirement of axial strain compatibility, that is, the rubber tube and the steel rod must have identical axial deformation. Use the deformation compatibility to derive mathematical expressions for P_r and P_s in terms of a , b , h , E_r , E_s , and P .

4. (25%) A frame ABC is made of two components AB and BC. Component AB is fixed at A and connected with BC at B using a hinge. At location C component BC is supported by a hinge end. The cross-section area, Young's modulus and moment of inertia for both components are respectively A , E , and I . Component AB is subjected to a uniform load q for entire span. What is the axial force in component BC?

