

本試題是否可以使用計算機: 可使用, 不可使用 (請命題老師勾選)

1. We often use the maximum distortional energy theory (von-Mises theory) to design machine elements. Please briefly describe this theory. (10%)
2. What is the proportional limit in the stress-strain diagram? (5%)
3. What are the axial, torsion, and bending rigidities of a slender member? (15%)
4. What differences between the string and beam? (5%)
5. Give the definition of the statically indeterminate problem in structural analysis. (10%)
6. What is the product moment of inertia I_{xy} of the cross section shown in Figure 1. (5%)

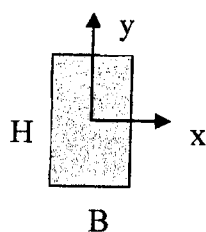


Figure 1

7. Consider a beam under four-point bending shown in Figure 2(a). The beam is built by bonding two blocks with size $a \times 2a$ (Figure 2(b)). The Young's modulus and shear modulus of elasticity of the beam material are E and G , respectively.
 - (1) Plot the shear force and bending moment diagrams. (10%)
 - (2) Compute the maximum bending stress σ_{\max} in tension. (10%)
 - (3) Compute the maximum shearing stress τ_{\max} in the beam. (10%)
 - (4) Compute the shearing stress τ at the interface of two blocks. (5%)
 - (5) Determine the ratio $\sigma_{\max} / \tau_{\max}$ when Poisson's ratio $\nu = 1/3$. Can we ignore the shearing stress in the beam design? Why? (15%)

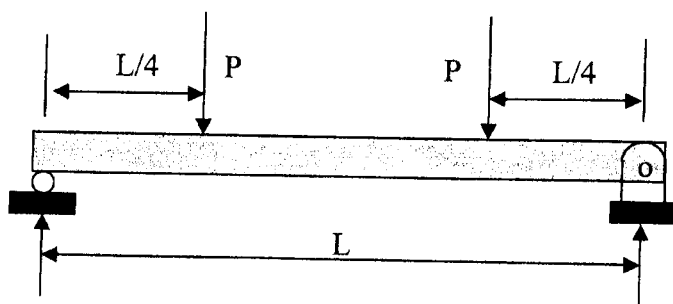


Figure 2(a)

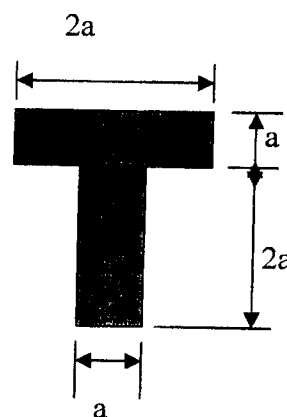


Figure 2(b)