(每題 20%，共 100分)

1. A round bar ACB of total length 2L rotates about an axis through the midpoint C with constant angular speed ω (radians per second). The material of the bar has specific weight γ. Derive a formula for the tensile stress σ_x in the bar as a function of the distance x from point C. What is the maximum tensile stress? Bar ACB is shown in Fig. 1.
2. The truss ABC shown in Fig. 2 is constructed of a horizontal steel bar BC having cross-sectional area 2580 mm^2 and length L and a steel tie rod AB with area 320 mm^2. The angle θ can be adjusted to any desired value by varying the length of the tie rod and the vertical position of support A, but the initial length L does not change. Determine the angle θ in order that the vertical deflection of joint B will be a minimum under the action of the load P.
3. Compare the angle of twist ϕ_1 for a thin-walled circular tube(see Fig, 3) as calculated from the approximate equation, $\phi = TL/2\pi Gr^3t$, with the angle of twist ϕ_2 calculated from the exact equation $\phi = TL/GI_p$. Express the ratio ϕ_1/ϕ_2 in terms of the nondimensional ratio $\beta = r/t$.
4. A simple beam AB supports a uniform load of intensity q = 6.0 kN/m over a portion of the span (see Fig. 4). Assuming that L = 10 m, a = 4 m, and b = 2 m, draw the shear-force and bending-moment diagrams for this beam.
5. The standpipe shown in Fig. 5 has inside diameter d = 2 m and wall thickness t = 10 mm. What height h of water will produce a circumferential stress of 15 MPa in the wall of the pipe?

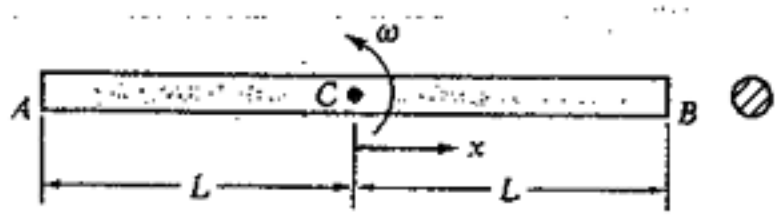

Fig. 1

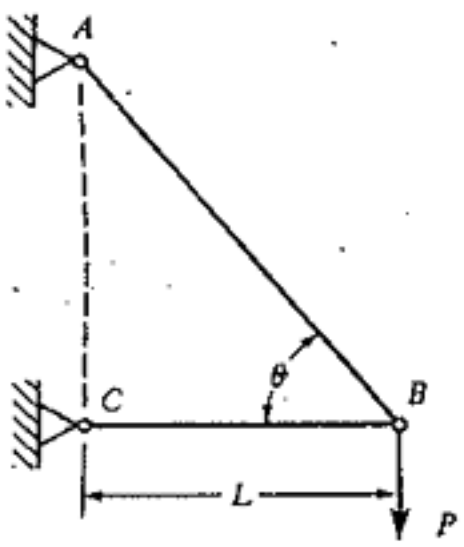

Fig. 2

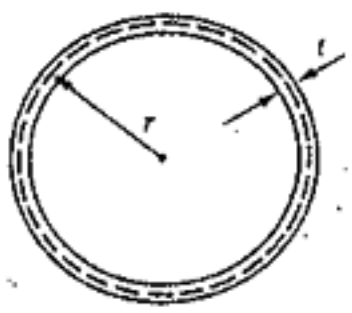

Fig. 3

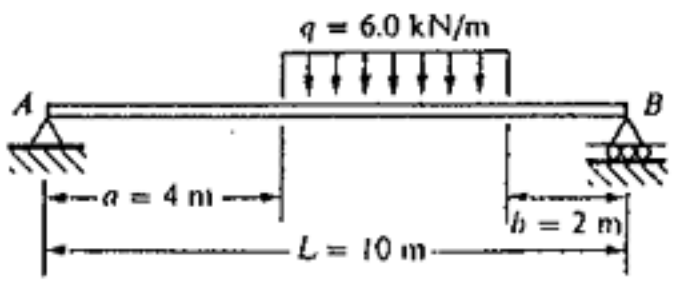

Fig. 4

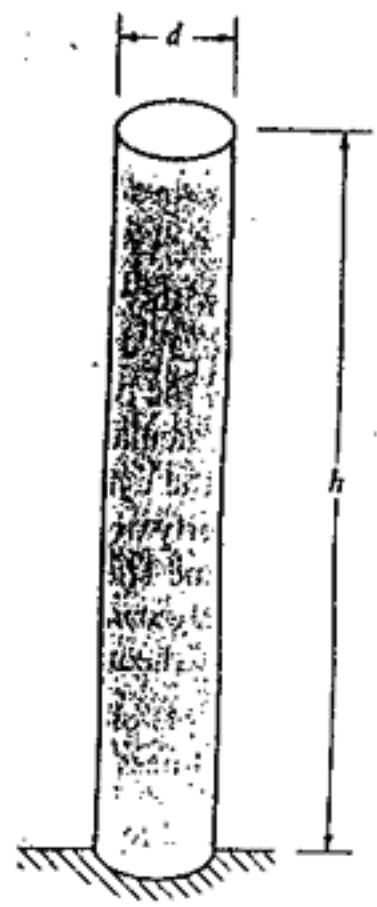

Fig. 5