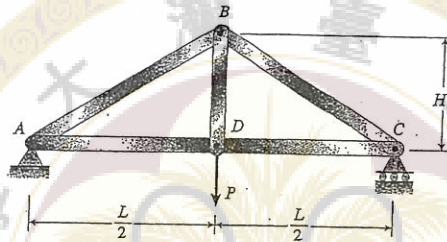
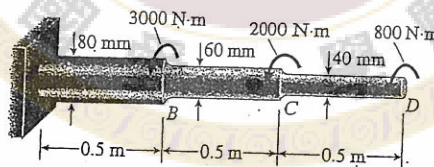


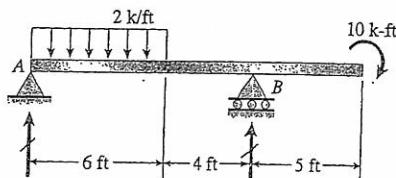
- (20%) 1. The pin-connected truss has a span $L = 6.0$ m and height $H = 1.5$ m. The truss is constructed of steel bars, each having cross-sectional area $A = 3000$ mm² and modulus of elasticity $E = 200$ GPa. A load P acts vertically at the midpoint D .
- (a) If $P = 120$ kN, what is the horizontal displacement of joint C ? (10%)
- (b) What is the maximum permissible load P_{\max} if the displacement of joint C is limited to 2.0 mm? (10%)



- (20%) 2. A stepped shaft $ABCD$ consisting solid circular segments is subjected to three torques. The torques have magnitudes 3000 N·m, 2000 N·m, and 800 N·m. The length of each segment is 0.5 m and the diameters of the segments are 80 mm, 60 mm, and 40 mm. The material is steel with shear modulus of elasticity $G = 80$ GPa.
- (a) Calculate the maximum shear stress τ_{\max} in the shaft. (10%)
- (b) Calculate the angle of twist ϕ_D (in degrees) at end D . (10%)

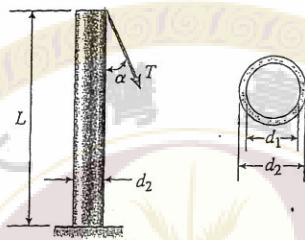


- (15%) 3. Draw the shear-force and bending-moment diagrams for the beam shown in the following figure.



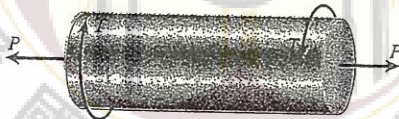
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(15%) 4. A vertical pole of aluminum is fixed at the base and pulled at the top by a cable having a tensile force T . The cable is attached at the outer surface of the pole and makes an angle $\alpha = 28^\circ$ at the point of attachment. The pole has length $L = 2.0$ m and a hollow circular cross section with outer diameter $d_2 = 250$ mm and inner diameter $d_1 = 200$ mm. Determine the allowable tensile force T_{allow} in the cable if the allowable compressive stress in the aluminum pole is 80 MPa.

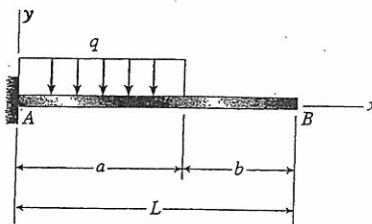


(15%) 5. A pressurized cylindrical tank with flat ends is loaded by torques T and tensile forces P . The tank has radius $r = 50$ mm and wall thickness $t = 3$ mm. The internal pressure $p = 3.5$ MPa and the torque $T = 500$ N·m.

What is the maximum permissible value of the forces P if the allowable tensile stress in the wall of the cylinder is 70 MPa?



(15%) 6. Derive the equations of the deflection curve for a cantilever beam AB carrying a uniform load of intensity q over part of the span. Also, determine the deflection δ_B at the end of the beam.



試題隨卷繳回