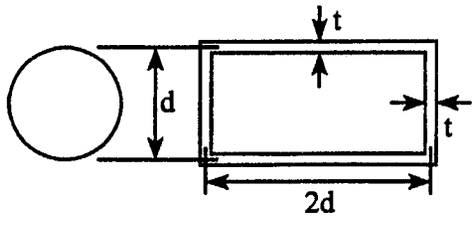
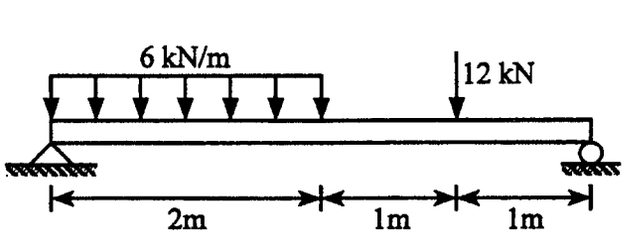
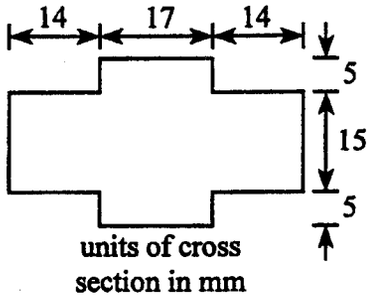
本試題是否可以使用計算機：☑可使用 ，□不可使用 （請命題老師勾選）

1. A solid circular bar having diameter d is to be replaced by a rectangular tube having cross-sectional dimensions $d \times 2d$ to the median line of the cross section. Determine the required thickness t_{min} of the rectangular tube so that the maximum shear stress in the tube will not exceed the maximum shear stress in the solid circular bar. (15%)

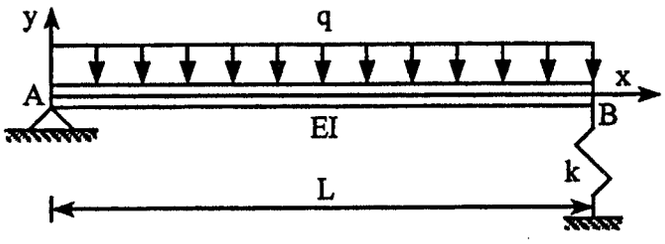


2. A simply supported beam with irregular cross section is subjected to loads as shown. Calculate the maximum bending stress and the maximum shear stress in the beam. (25%)

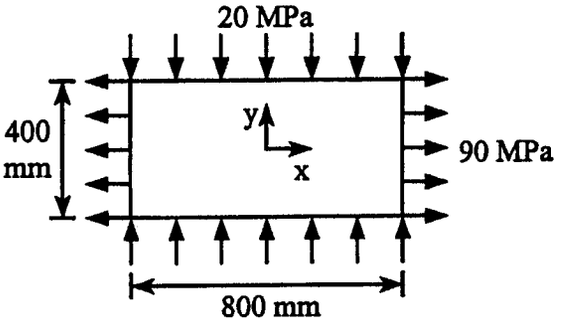




3. A beam with a uniform load q is pin supported at end A and spring supported at end B. The stiffness of the spring is $k = 48EI/L^3$. Find the deflection at end B and the rotation at end A. (20%)



4. A rectangular plate is subjected to biaxial stresses as shown. The thickness of the plate is $t = 20$ mm. The material properties of the plate are $E = 200$ GPa and $\nu = 0.3$. (i) Find the maximum in-plane shear strain in the plate. (ii) Find the change Δt in the thickness of the plate. (iii) Find the change ΔV in the volume of the plate. (20%)



5. A simply supported beam is subjected to axial loads P with eccentricity e as shown. (i) Derive the equation of the deflection curve. (ii) Obtain the critical buckling load of the beam. (20%)