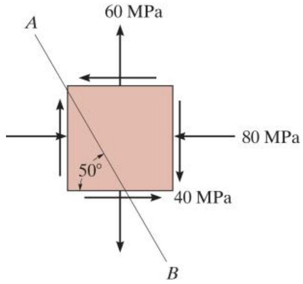
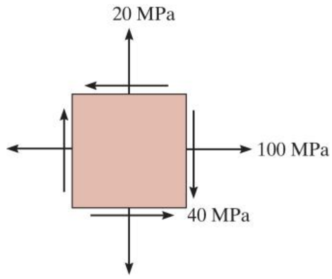
1. The state of plane stress at a point is represented by the element shown. Determine the stress components acting on the inclined plane *AB*. [15%] Ans:-61.5, 61.99 MPa



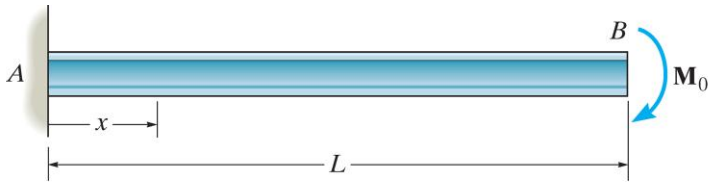
2. The state of stress at a point is shown on the element. (a) Determine the principal stresses and the corresponding orientation of the element. (b) Determine the maximum in-plane shear stress and average normal stress at the point, and specify the orientation of the element. You must use Mohr's circle to solve this problem. [20%] Ans: (a) 117, 3.43 MPa, 22.5^0 (CW) (b) 56.6, 60 MPa, 22.5^0 (CCW)



3. The state of plane strain at a point has components $\varepsilon_x = 180(10^{-6})$, $\varepsilon_y = -120(10^{-6})$, $\gamma_{xy} = -100(10^{-6})$. (a) Determine the in-plane principal strains. (b) Determine the maximum in-plane shear strain and average normal strain. You must use Mohr's circle to solve this problem. [15%] Ans: (a)188,-128 (10^{-6}) (b) 316, 30 (10^{-6})

4. The state of plane strain at a point is represented on an element having components $\varepsilon_x = 150(10^{-6})$, $\varepsilon_y = 200(10^{-6})$, and $\gamma_{xy} = -700(10^{-6})$. Determine the state of strain on an element oriented 60^0 counterclockwise (逆時針) from the reported position. [15%] Ans: -116, 466, 393 (10^{-6})

5. Determine the elastic curve for the cantilevered beam, which is subjected to the couple moment M_0. Also calculate the maximum slope and maximum deflection of the beam. EI is constant. [15%]



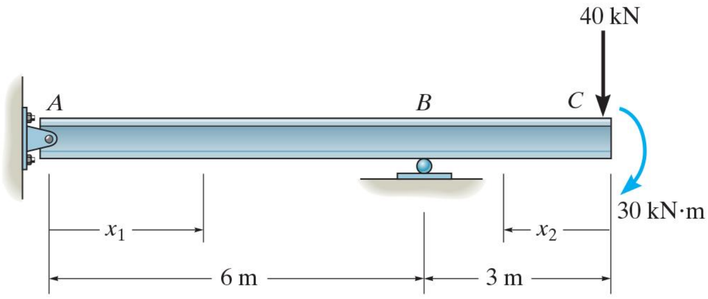
Ans:

$\theta_{max} = -\dfrac{M_0 L}{EI}$,

$v = -\dfrac{M_0 x^2}{2EI}$,

$v_{max} = -\dfrac{M_0 L^2}{2EI}$

6. Determine the equations of the elastic curve using the x_1 and x_2 coordinates, and specify the slope at A and the deflection at C. EI is constant. [20%]



$$\theta_A = \left.\frac{dv_1}{dx_1}\right|_{x_1=0} = \frac{150\ \text{kN}\cdot\text{m}^2}{EI} \quad \theta_A \qquad \textbf{Ans.}$$

Substitute the values of C_1 and C_2 into Eq. (2) and C_3 and C_4 into Eq (4),

$$v_1 = \frac{1}{EI}\left(-\frac{25}{6}x_1^3 + 150x_1\right)\text{kN}\cdot\text{m}^3 \qquad \textbf{Ans.}$$

$$v_2 = \frac{1}{EI}\left(-\frac{20}{3}x_2^3 - 15x_2^2 + 570x_2 - 1395\right)\text{kN}\cdot\text{m}^3 \qquad \textbf{Ans.}$$

At C, $x_2 = 0$. Thus

$$v_C = v_2\big|_{x_2=0} = -\frac{1395\ \text{kN}\cdot\text{m}^3}{EI} = \frac{1395\ \text{kN}\cdot\text{m}^3}{EI}\downarrow \qquad \textbf{Ans.}$$