

## Two-dimensional stress and strain – supplementary questions

- For the elements illustrated in Figure Q1, construct Mohr's circle of stress to find the stress components on the inclined planes shown.

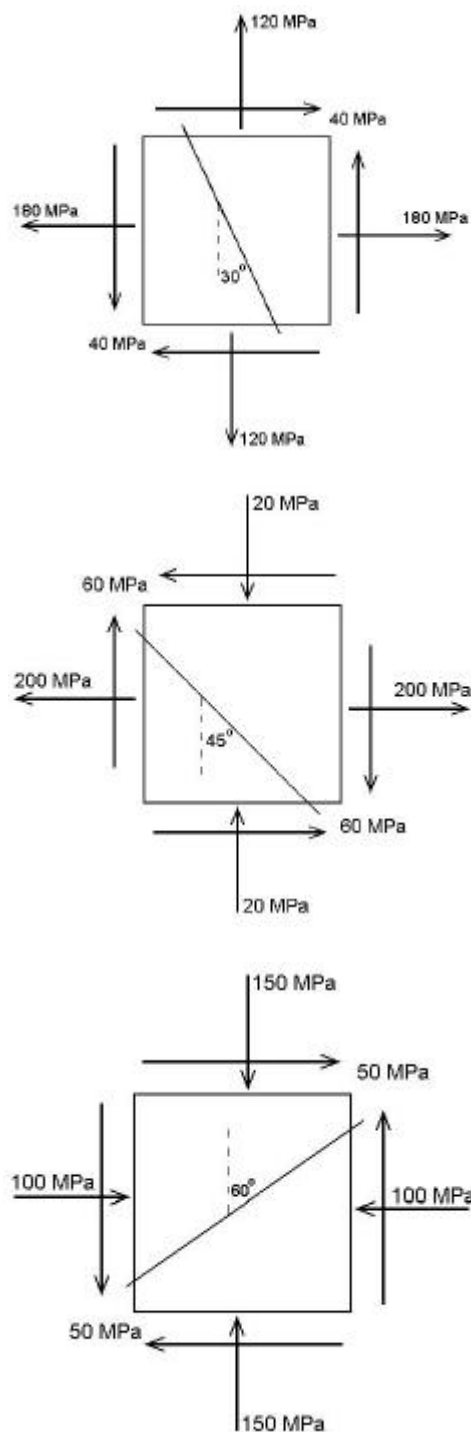


Figure Q1.

Ans:

(a)  $\sigma_n = 199.6$  MPa,

$\tau_s = -5.98$  MPa

(b)  $\sigma_n = 30$  MPa,

$\tau_s = -110$  MPa

(c)  $\sigma_n = -180.8$  MPa,

$\tau_s = -3.35$  MPa

2. Figure Q2 illustrates a bar having a cross sectional area of  $0.0025\text{m}^2$ . Estimate the stresses on an element at P and aligned with the xy directions. Draw Mohr's circle and use it to determine the stresses on elements at inclinations of (a)  $15^\circ$  and (b)  $75^\circ$  to the x direction.

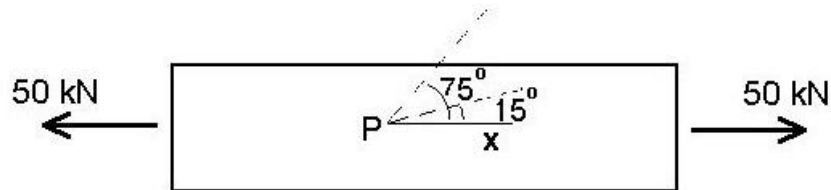


Figure Q2.

Ans:

(a)  $\sigma_{n1} = 18.5 \text{ MPa}$ ,  $\sigma_{n2} = 1.5 \text{ MPa}$

(b)  $\sigma_{n1} = 1.5 \text{ MPa}$ ,  $\sigma_{n2} = 18.5 \text{ MPa}$        $\tau_s = 5 \text{ MPa}$

3. A column rests on a horizontal foundation block. The column transmits to the block a compressive stress of  $174 \text{ MPa}$ , together with a shear stress of  $46.6 \text{ MPa}$ . Find the magnitude and direction of the principal stresses at a point just below the top face of the block.

Ans:

$\sigma_1 = -185 \text{ MPa}$  and  $\sigma_2 = 11.7 \text{ MPa}$  at  $14^\circ$  and  $104^\circ$  respectively to the vertical.