ESO 202A/204: Mechanics of Solids (2016-17 II Semester)
Assignment No. – 4

4.1 The piece of rubber is originally rectangular and subjected to the deformation shown by the dashed lines. Determine (a) the average shear strain at A and (b) the average normal strain along the diagonal DB and side AD (Fig. 4.1).

4.2 The state of plane strain on an element is

$\varepsilon_{xx} = -300\times10^{-6}$, $\varepsilon_{yy} = 0$, $\gamma_{xy} = 150\times10^{-6}$

Use the strain-transformation equations to determine the equivalent state of strain which represents (a) the principal strains, and (b) the maximum in-plane shar strain and the associated average normal strain. Specify the orientation of the corresponding elements for these states of strain with respect to the original element (Fig. 4.2).

4.3 The state of strain at a point on a wrench has components

$\varepsilon_{xx} = 120\times10^{-6}$, $\varepsilon_{yy} = -180\times10^{-6}$, $\gamma_{xy} = 150\times10^{-6}$

Use Mohr's circle to determine (a) the in-plane principal strains and (b) the maximum in-plane shear strain and average normal strain. In each case specify the orientation of the element and show how the strains deform the element within the x-y plane.

4.4 The strain rosette of configuration shown in Fig. 4.4 is mounted on a beam. The following readings are obtained for each gauge:

$\varepsilon_a = 200\times10^{-6}$, $\varepsilon_b = -450\times10^{-6}$, $\varepsilon_c = 250\times10^{-6}$

Determine (a0 the in-plane principal strains and (b) the maximum in-plane sear strain and average normal strain. In each case show the deformed element due to these strains.

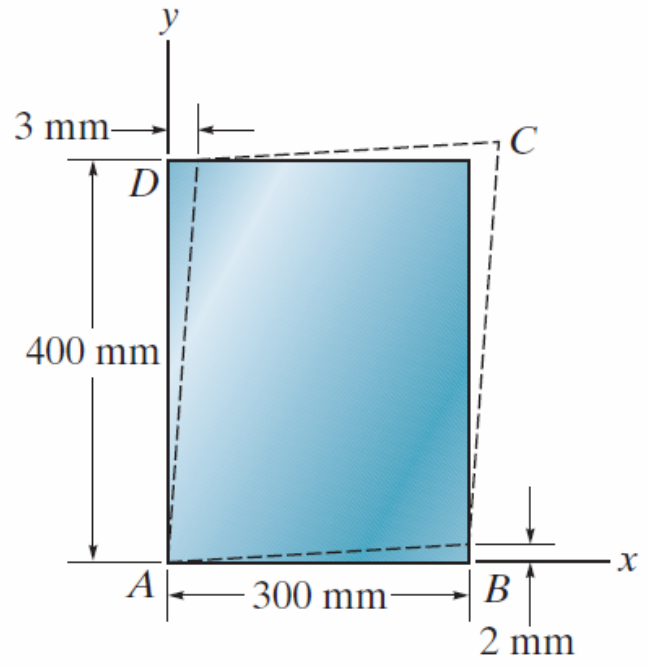

Fig. 4.1

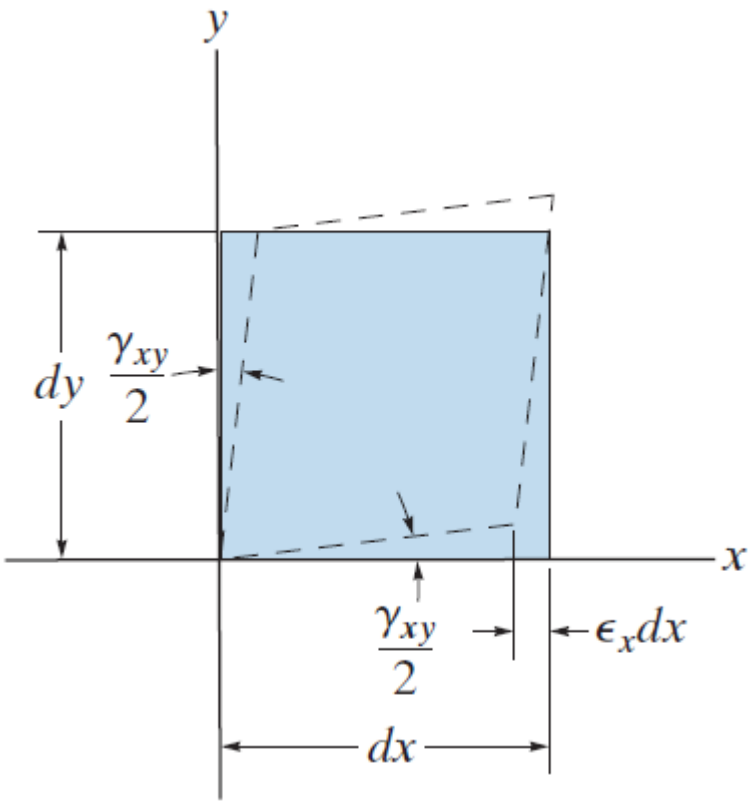

Fig. 4.2

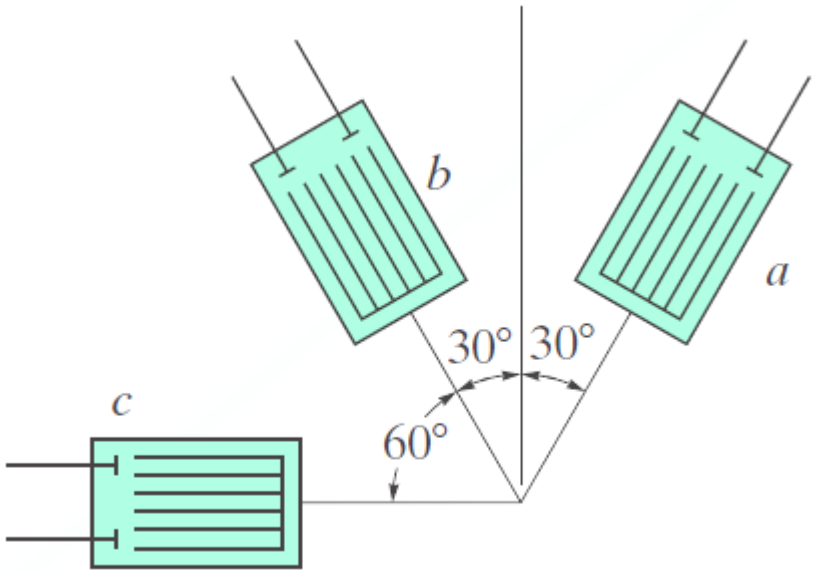

Fig. 4.4