ASSIGNMENT 6

1. Find the principal stresses and the orientation of the principal axes of stress for the following cases of plane stress

   $\sigma_x = 40$ MPa, $\sigma_y = 0$ MPa, $\tau_{xy} = 80$ MPa

2. Find the principal stresses and the orientation of the principal axes of stress for the following cases of plane stress

   $\sigma_x = 140$ MPa, $\sigma_y = 20$ MPa, $\tau_{xy} = -60$ MPa

3. A rectangular plate is under a uniform state of plane stress in the xy plane. It is known that the maximum tensile stress acting on any face (whose normal lies in the xy plane) is 75 MPa(σ_y). It is also known that on a face perpendicular to the x axis there is acting a compressive stress of 15 MPa and no shear stress. Find the normal stress components acting on the faces perpendicular to a and b axes as shown in figure 1.

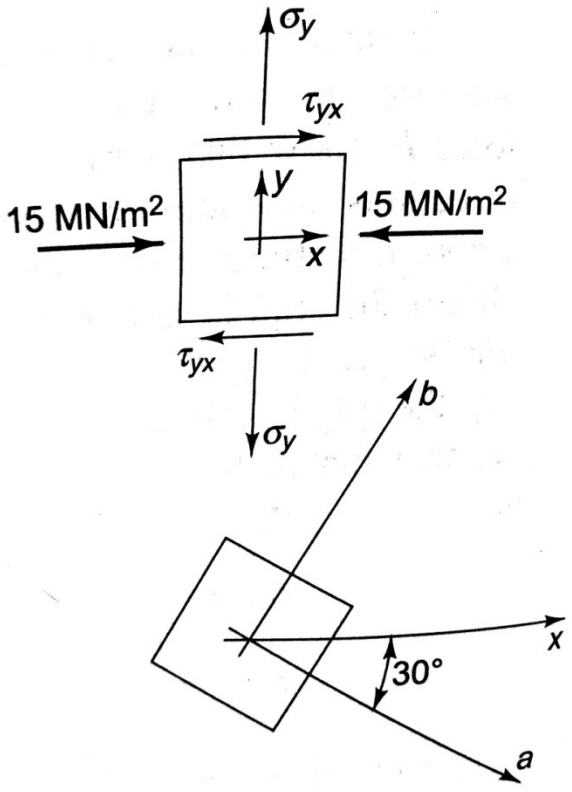

Figure 1

4. Find the shear stress components acting on the faces perpendicular to a and b axes as shown in figure 1.
5. In a state of plane strain in the xy plane the strain components associated with the xy axes are

   $\varepsilon_x = 800 \times 10^{-6}$, $\varepsilon_y = 100 \times 10^{-6}$, $\gamma_{xy} = -800 \times 10^{-6}$

   Find the magnitudes of the principal strains.
6. With reference to question no 5 find the orientation of the principal strain direction.
7. At a point in a body the principal strains are

   $\varepsilon_I = 700 \times 10^{-6}$, $\varepsilon_{II} = 300 \times 10^{-6}$, $\varepsilon_{III} = -300 \times 10^{-6}$

   What is the maximum shear strain component at the point?
8. The readings of a 45˚ strain rosette as shown in figure 2 are

   $\varepsilon_a = 100 \times 10^{-6}$, $\varepsilon_b = 200 \times 10^{-6}$, $\varepsilon_c = 900 \times 10^{-6}$

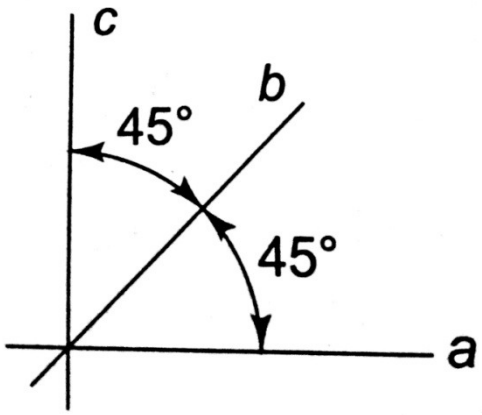

Figure 2

   Find the magnitude of the principal strains in the plane of the rosette.

9. The readings of a 45˚ strain rosette as shown in figure 2 are

   $\varepsilon_a = 1200 \times 10^{-6}$, $\varepsilon_b = 400 \times 10^{-6}$, $\varepsilon_c = 60 \times 10^{-6}$

   Find the magnitude of the principal strains in the plane of the rosette.