Question Bank 1 (Analysis of stresses and Mohr's Circle)

1. Given the state of stress is: σ_x =800MPa, σ_y = -200MPa, τ_{xy} = 200MPa. Determine -- (a) Principal stresses (b) the stresses on a plane makes 60^0 clockwise to the plane of principal stresses. Center is located at (300,0), Point A = (800, 200). Results: (a) At principal plane stresses are: (838,0) MPa, 10.9^0; (b) The stresses are: (223, -332) MPa.
2. Find the principal normal and maximum shearing stresses and show them on a properly oriented element for the state of stress (in MPa) shown in Table 1. by (a) analytically and (b) Mohr's circle of stresses.
3. Given the state of stress is: σ_x =800MPa, σ_y = -200MPa, τ_{xy} = 200MPa. Determine -- (a) Principal stresses (b) the stresses on a plane makes 60^0 clockwise to the plane of A.
4. Construct a Mohr's circle for the particular case of biaxial tension where $\sigma_X = \sigma_Y$. What is the maximum shear stress in such case?
5. Direct tensile stresses of 120 MN/m^2 and 70 MN/m^2 act on a body on mutually perpendicular planes. What is the magnitude of the shearing stress that can be applied so that major principle stress at the point does not exceed 135 MN/ m^2? Determine the value of major principle stress and the maximum shear stress.
6. An element is subjected to the principal stresses $\sigma_1 = \sigma_x$ = 40MPa and $\sigma_2 = \sigma_y$ = -30MPa. Compute the stress components of planes on planes whose normal are at $+30^0$ and $+120^0$ with the x-axis. Show your answers on a complete sketch of differential element.
7. A rectangular block of material is subjected to a tensile stress of 110N/mm^2 on one plane and a tensile of 47 N/mm^2 on a plane at right angles to the former. Each of the above stresses is accompanies by a shear stress of 63N/mm2. Determine the principal stresses, principal planes and the maximum shear stresses.
8. At a point in a strained material, the principal stresses are100 N/mm^2 (T) and 40 N/mm^2 (C). Determine the resultant stress in magnitude and direction in a plane inclined at 600 to the axis of major principal stress. What is the maximum intensity of shear stress in the material at the point?
9. The stresses at a point in a strained material is σ_x= 200 N/mm^2, σ_y = -150N/mm^2 and τ = 80 N/mm^2. Solve for the principal plane and principal stress using graphical method and verify with the analytical results.
10. The principal stresses in the wall of a container are 40 MN/m^2 and 80 MN/m^2. Determine the normal, shear and resultant stresses in magnitude and direction in a plane, the normal of which makes an angle of 30o with the direction of maximum principal stress.
11. An elemental cube is subjected to tensile stresses of 30 N/mm^2 and 10 N/mm^2 acting on two mutually perpendicular planes and a shear stress of 10N/mm2 on these planes. Draw the mohr's circle of stresses and determine the magnitudes and direction of principal stresses and also the greatest shear stress.
12. For the elements illustrated in Fig. 1 calculate the stress components on the inclined planes.
13. Direct tensile stresses of 120 MN/m^2 and 70 MN/m^2 act on a body on mutually perpendicular planes. What is the magnitude of the shearing stress that can be applied so that major principle stress at the point does not exceed 135 MN/ m^2? Determine the value of major principle stress and the maximum shear stress.

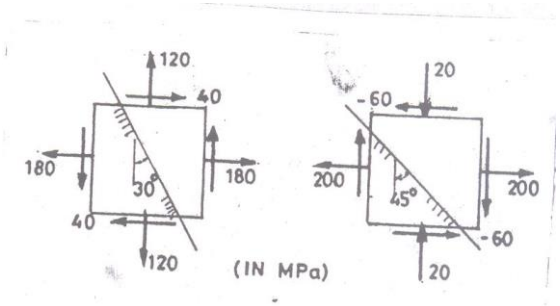

Fig. 1.

Table - 1

Element.	σ_x	σ_y	τ_{xy}
1.	60	20	0
2.	-30	50	-40
3.	200	0	80
4.	20	30	20