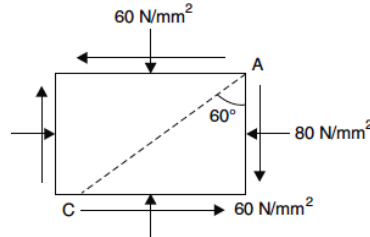## PRINCIPAL STRESSES & STRAINS
THEORIES OF FAILURES
UNIT-IV

1.   The state of stress in a two dimensionally stressed material is as shown in Figure . Determine the principal stresses, principal planes and the maximum shear stress. Determine normal and tangential stresses on plane AC. Draw the Mohr's Circle and represent the points on it.

2.   The surface of a steel machine member is subjected to stresses of 100 MPa in X-direction, 20 MPa in Y-direction. What tensile strength is required to provide a factor of safety of 2.5 with respect to yielding (a) according to the maximum shear stress theory, (b) maximum principal stress theory and (c) according to the Distortion energy theory?

3. Draw "Mohr's stress circle" for principal stresses of 80 N/mm2 tensile and 40 N/mm2 compressive and find the resultant stresses on planes making 25^0 and 60^0 with the major principal plane. Find also normal and tangential stresses on these planes?

4. A steel specimen is subjected to the following principal stresses 120 N/mm^2 (Tensile) 50 N/mm^2 (compressive). If the proportionality limit for the steel specimen is 225 N/mm^2, find the factory of safety according to:
a) Maximum principal stress theory
b) Maximum principal strain theory.
c) Maximum Shear stress theory.

5. The air vessel of torpedo is 500 mm. external dia. and 10 mm. thick, the length being 2000 mm. Find the change in external dia. and length, when it is charged to 12 N/mm^2 internal pressure. Take E = 200 Gpa and poisson's ratio is 0.3.

6. A bolt is subjected to an axial pull of 9 kN and a transverse shear of 4.5 kN. Determine the diameter of the bolt if the elastic limit in tension is 225 MPa using maximum principal stress theory and the maximum shear stress theory. Assume a factor of safety of 3.

7.   At a point in a strained material, the intensities of normal stresses on two planes at right angles to each other are 35 N/mm^2 and 20 N/mm^2 both tensile. They are accompanied by shear stress of 15 N/mm^2. Find the principal planes and principal stresses. Find also maximum shear stress.

8. A circular shaft of 12 cm dia. is subjected to combined bending and twisting moments. The bending moment being three times the twisting moment. If the direct tensile yield point of material is 350 MN/m^2 and factor of safety on yield is 4, find the allowable twisting moment by a) Maximum principal stress theory b) Maximum shear stress theory

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