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**Mechanical Design 1**

**Class Section 01**

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# **Problem 1**

Diagram

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**Solution:**

For this question, we are asked to calculate the allowable load using the Coulomb-Mohr theory and a factor of safety of .

Since the load acts in a plane of symmetry, there are three independent equations of equilibrium.

The internal forces at the section are found using the equations of equilibrium as follows:

Thus, there are two internal forces on the section, an axial force , which produces a constant normal stress a over the section, and a bending moment , which produces a linear variation of normal stress over the section. The cross-sectional area and the second moment of the cross-sectional area with respect to the centroidal axis NA are

The stresses and due to the internal forces are

The maximum tensile flexural stress occurs at the left edge of section NA (point ) and is

The maximum compressive flexural stress occurs at the right edge of section NA (point ) and is



The distributions of stresses a 1 and a2 are shown in figures above, respectively. Superimposing the normal stresses at points and gives

Table

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Therefore, the allowable load using the Coulomb-Mohr theory and a factor of safety of is equal to .

# **Problem 2**



**Solution:**

For this question, we are asked to determine the maximum possible load that can be applied before the plate (a) yields, and (b) has uncontrollable crack growth.



Chart

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