

APL105 – MECHANICS OF SOLIDS AND FLUIDS
Minor 1

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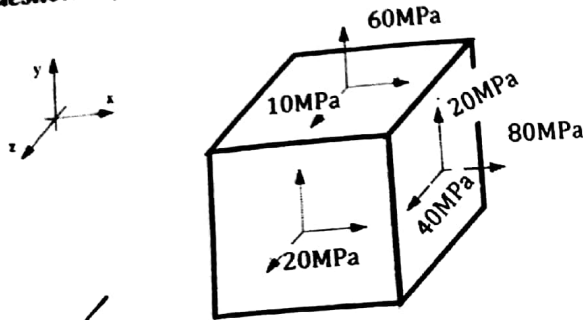
Entry #: **2016TT10860**

Question 1 (3 Marks): State the difference between Plane stress and Plane Strain condition.

Question 2 (5 Marks): Prove the following strain compatibility equation:

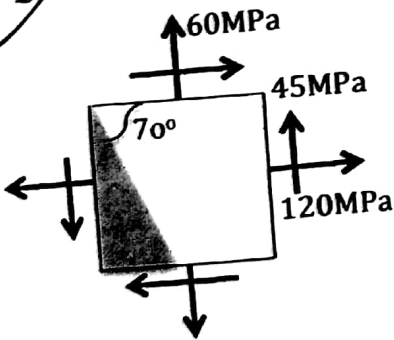
$$\frac{\partial^2 \epsilon_{xx}}{\partial y \partial z} + \frac{\partial^2 \epsilon_{yz}}{\partial x^2} = \frac{\partial^2 \epsilon_{xz}}{\partial x \partial y} + \frac{\partial^2 \epsilon_{xy}}{\partial x \partial z}$$

Question 3 (3+1+3 Marks): For a given stress distribution as shown below determine:



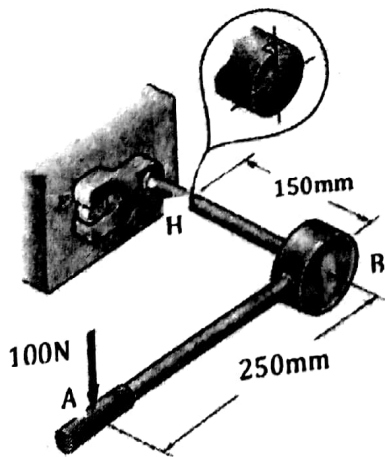
1. What are the Principal stresses?
2. What is the max shear stress?
3. What is the stress vector on a plane perpendicular to a vector: $2i + j + k$

Question 4 (5 Marks):



For the given state of stress, determine the normal and shearing stresses exerted on the oblique face of the shaded triangular element shown. Use a method of analysis based on the equilibrium of that element, as was done in the tutorial.

Question 5 (5 Marks):



A mechanic uses a crowfoot wrench to loosen a bolt at E. Knowing that the mechanic applies a vertical 100 N force at A, determine the principal stresses and the maximum shearing stress at point H located as shown on top of the 18 mm diameter shaft.