

ENGR 527/727: Advanced Mechanics of Materials

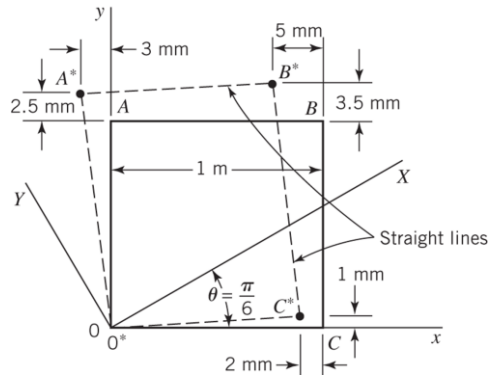
Department of Mechanical Engineering

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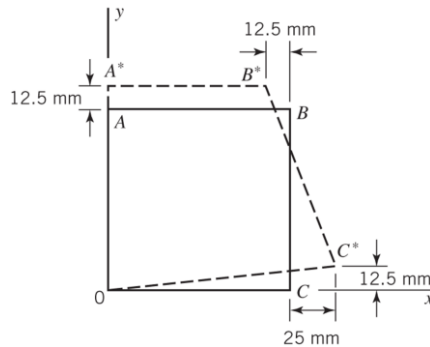
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Homework 4: Stress–Strain Relationships and Behavior: Hooke’s Law

1. A square glass block in the side of a skyscraper is loaded so that the block is in a state of plane strain ($\epsilon_{zz} = \epsilon_{zx} = \epsilon_{zy} = 0$). (a) Determine the displacements for the block for the deformations shown and the strain components for the (x, y) coordinate axes. (b) Determine the strain components for the (X, Y) axes.



2. A square plate, 1 m long on a side, is loaded in a state of plane strain and is deformed as shown. (a) Write expressions for the u and v displacements for any point on the plate. (b) Determine the components of Green strain in the plate. (c) Determine the total Green strain at point B for a line element in the direction of line OB. (d) For point B, compare the components of strain from part (b) to the components of strain for small-displacement theory. (e) Compare the strain determined in part (c) to the corresponding strain using small-displacement theory.



3. Solve Problem 2.3 from the textbook.
4. Solve Problem 2.4 from the textbook.
5. Solve Problem 2.9 from the textbook.
6. Solve Problem 2.12 from the textbook.
7. Solve Problem 2.22 from the textbook.
8. Solve Problem 2:24 from the textbook
9. Solve Problem 2:28 from the textbook
10. Solve Problem 2:52 from the textbook
11. Solve Problem 2:53 from the textbook
12. Solve Problem 2:54 from the textbook