

Lab 04b Program 5

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“Aggies do not lie, cheat, or steal, or tolerate those who do”

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Section: 219

Assignment: 04b Program 5

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Given information

Goal: Prompt the user for a strain value, then calculate and report the *stress* value and the *region* the value falls within.

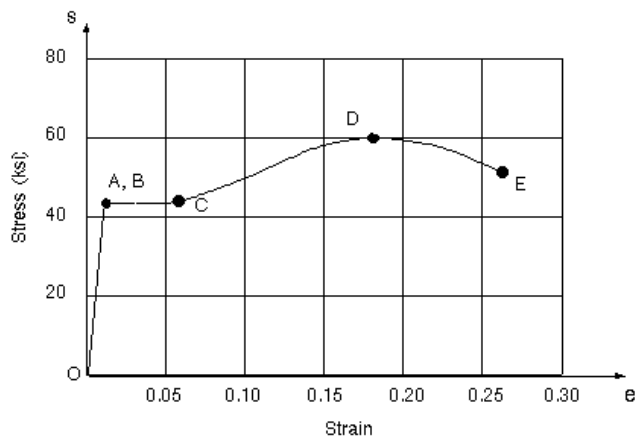
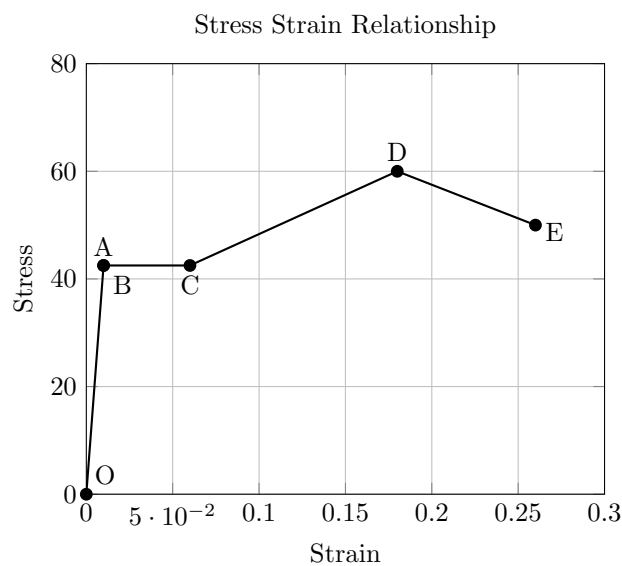


Figure 3. Stress-strain diagram for structural steel in tension.

Section	Points
Linear Elastic	O - A
<i>Ignored</i>	A - B
Plastic	B - C
Strain Hardening	C - D
Necking	D - E

A. Linear Model



Point	x	y
O	0	0
A	0.01	42.5
B	0.01	42.5
C	0.06	42.5
D	0.18	60
E	0.26	50

B. Values and Variables

Name	Type	Description
<code>user_strain</code>	<code>float</code>	The given strain on the object.
<code>O</code>	<code>tuple[float, float]</code>	The value, as <code>(strain, stress)</code> , that this point corresponds to.
<code>A</code>		
<code>B</code>		
<code>C</code>		
<code>D</code>		
<code>E</code>		
<code>region</code>	<code>string</code>	The name of the region that <code>user_strain</code> is in.
<code>strain1</code>	<code>float</code>	The information needed to perform linear interpolation. Should contain the values of the points on either side of <code>user_strain</code> .
<code>strain2</code>		
<code>stress1</code>		
<code>stress2</code>		
<code>calc_stress</code>	<code>float</code>	The predicted stress that we have just computed.

C. Procedure

1. Get user input for value of `user_strain`.
2. Find in what portion of the domain it is.
 - (a) Check if `user_strain` is below `A[0]`, the strain at point A.
 - (b) If it is, set `O` to be the left bound (`strain1` and `stress1`) and `A` to be the right bound (`strain2` and `stress2`). Additionally, assign `region` with the name of this region.
 - (c) If it is not, repeat with `B`, and then `C`, and so on, using the appropriate points to fill in the `strains` and `stresses`.
3. Calculate an expected stress value.
 - (a) Set up a linear interpolation using `strain1`, `strain2`, `stress1`, and `stress2`.
 - (b) Calculate a predicted stress using `user_strain`.
4. Display the `region` and `calc_stress` variables.

D. Test Cases

Input	Expected	Region	Type	Notes
0.005	21.25	O - A	Typical	Should be able to interpolate from the given points
0.03	42.5	B - C	Typical	
0.1	4.833	C - D	Typical	
0.2	52.5	D - E	Typical	
0	0	O	Edge	This is Point O
0.01	42.5	A, B	Edge	This is Points A and B
0.06	42.5	C	Edge	This is Point C
0.18	60	D	Edge	This is Point D
0.26	50	E	Edge	This is Point E
-1	N/A	N/A	Edge	Needs to handle outside points gracefully
1	N/A	N/A	Edge	