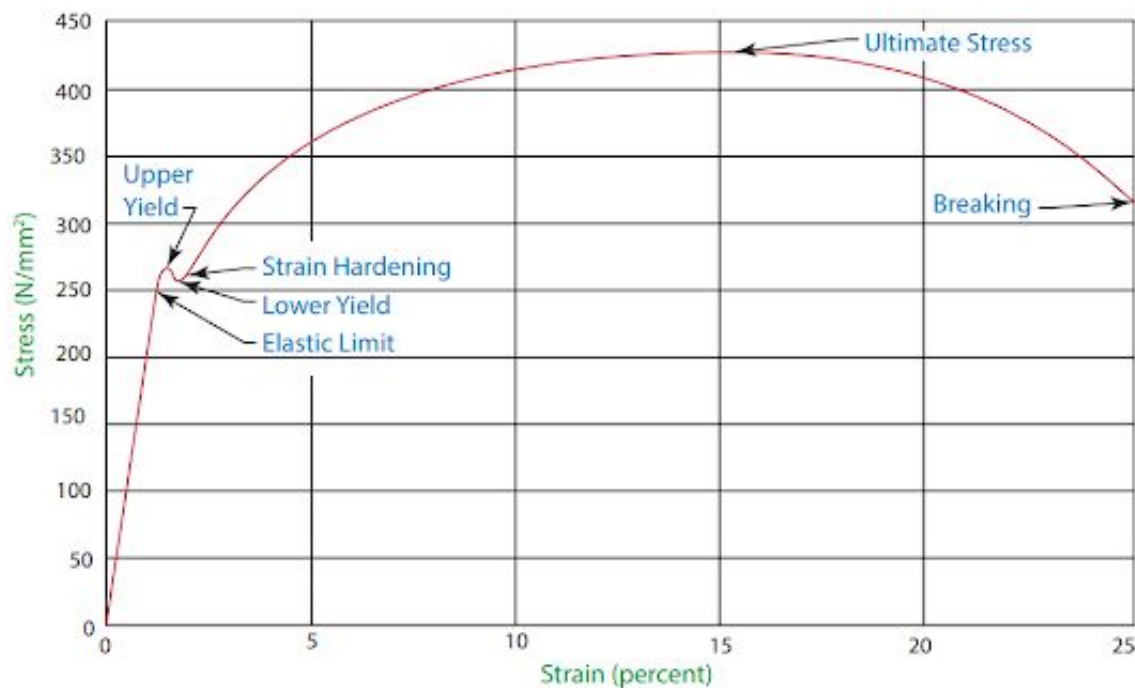


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Stress Strain Planning Document

Problem:

1. Create a program that will find the stress in MPa given the strain of an axially-loaded steel member. The program will also tell the user whether the strain is within elastic limit or deformation stage.
2. Annotation of below figure with key values indicated. A value for the Young's Modulus of this steel and the equations you will use to approximate the curve in the figure.



Young's Modulus = 167

$$f(x) = 167x, \quad 0 \leq x < 1.5$$

$$f(x) = 213.33x^3 - 1280x^2 + 2526.67x - 1380, \quad 1.5 \leq x < 2.58$$

$$f(x) = -0.98x^2 + 28.9x + 213.63, \quad 2.58 \leq x \leq 25$$

Estimated key points: (1.5, 250), (1.75, 265), (2, 260), (2.5, 270), (2.58, 281.58), (3, 300), (15.5, 425), (25, 320)

3. Skeleton outline of program
 - a. Key variables

strain = strain input (float)

Stress (float)

Within_elastic = (bool) true if strain is below 1.5, false if strain is above 1.5

- b. Required input
Strain
 - c. Equations
$$f(x) = 167x, 0 \leq x < 1.5$$
$$f(x) = 213.33x^3 - 1280x^2 + 2526.67x - 1380, 1.5 \leq x < 2.58$$
$$f(x) = -0.98x^2 + 28.9x + 213.63, 2.58 \leq x \leq 25$$
Where x is strain
 - d. Any **if**-type structure
See Equations, (i.e if Strain is between 0 and 1.5, etc.)
If loop to check if strain is within elastic limits
 - i. Remember Pyramid approach
4. List of test cases
- a. Input: 0.5, Output: Elastic 83.5
 - b. Input: 2, Output: Elastic 259.98
 - c. Input: 5, Output: Elastic 333.63
 - d. Input: 26, Output: The pipe couldn't take that much stress, it's broken!