Program will calculate the stress of iron based on the stress-strain diagram shown in handout. Any curved slopes will be converted into a linear approximation for ease of use.

Will take input of strain as float value and convert to separate Boolean variable. This process will allow for easier comparison during “if-statements”.

The approximated slopes will be input by programmer before code is run. All calculations will be based on the linear functions put in.

The user Boolean values will decide which function is appropriate to use for final answer using “if-statements”.

Once proper function is chosen, user input will be place in place of the variable and f(x) will be you Stress value.

Print Stress value.

Young’s Modulus Definition: the modulus of elasticity is the relationship between stress and strain for a bar in simple tension/compression. It is represented as the linear portion of the graph.

Input Variables needed:

strainValue = input”string” (this will be from 0.0 – 0.30)

Additional Variables:

Booleans: (will not be indented in code, just for clarification of PDF)

linearStrain = (0 <= strainValue < 0.01)

plasticStrain = (0.01 <= strainValue < 0.06)

strainHardening = (0.06 <= strainValue < 0.18)

neckingStrain = (0.18 <= strainValue < 0.26)

breakStrain = (strainValue >= 0.26)

Input point values:

Oo = 0 (x and y values of O are the same, removed one for redundancy)

Ya = 42

Xa = 0.01

Yc = 43

Xc = 0.06

Yd = 60

Xd = 0.18

Ye = 50

Xe = 0.26

Calculate slopes:

slopeOA = (Ya – Yo)/(Xa – Xo)

slopeBC = (Yc – Yb)/(Xc – Xb)

slopeCD = (Yd – Yc)/(Xd – Xc)

slopeDE = (Ye-Yd)/(Xe – Xd)

Calculate functions: (based on y= m(x – x_1) + y_1)

functionOA = slopeOA(strainValue – Oo) + Oo

functionBC = slopeBC(strainValue – Xb) + Yb

functionCD = slopeCD(strainvalue – Xc) + Yc

functionDE = slopeDE(strainvalue – Xd) + Yd

Tests:

Input (Strain)	Region	Edge/Typical	Output (KSI)
-1	Off-chart	Edge	outside
0	O - A	Edge	0
0.01	point A	Edge	42
0.06	point C	Edge	43
0.1	C - D	Typical	48.7
0.15	C - D	Typical	55.8
0.17	point D	Edge	58.6
0.2	D - E	Typical	57.5
0.25	D - E	Edge	51.2
0.26	point E	Edge	50
0.3	>E	Edge	50