TAM 554- Plasticity Name\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Homework #1 Due September 6, 2021

The stress-strain relationship proposed by Bodner is given below:





1070 Steel Cu( copper) Cu

(R.T) (R.T) (550°C)

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Do(1/sec) 104 104 104

n 8.2 7.5 3.9

Ko (MPa) 552 63 16

K1 (MPa) 1260 250 250

m (MPa -1) 0.06 0.13 0.13

E (MPa) 200,000 120,000 100,000

1. Please determine the stress-strain curve to a strain of 0.1 using the constants given above. The strain rate for the simulations is to be 10-4 1/sec. Comment on your results.

(b) For Cu, apply simultaneous T (from R.T. to 550°C) and total strain (0 to 0.02) in an out-of-phase (strain increasing and temperature decreasing simultaneously) fashion. Heat and cool times are 200 seconds respectively. Use linear interpretation of constants above. Write the equations with thermal strain term included with a constant coefficient of thermal expansion of 20.10-6 1/°C, ie. Total strain=Elastic Strain+ Inelastic Strain+ Thermal Strain. Plot the stress-mechanical strain curve where Mechanical strain=Elastic Strain+Inelastic Strain.