

UDDEHOLM PROBLEM MIMM 2023

Tensile testing of elastic-plastic materials

Mechanical characterization of materials is essential in the development and quality assurance in all of materials manufacturing. One of the most common and well-known tests is the tensile test. In essence, the material is shaped into a slender rod and then subjected to an elongating deformation until it fails. The result from this test gives information about the strength, stiffness, and ductility of the material. The tensile test can also be used to find the true stress-strain relation for the material, however this requires more advanced testing and evaluation techniques than if only the former results are sought. This is due to the necking phenomena that occurs at the end of a tensile test where the stress state changes from uniaxial to triaxial.

The task is to try to find a way to calculate the true stress-strain relation using only the force-