Appendix F

Assignment 4

1. Consider an yield criterion of the form $\Phi(J_2, J_3, \beta_n) = 0$. Prove that for such a criterion, the incremental plastic strain tensor is incompressible. In other words show that $d\epsilon_{kk}^p = 0$.

2. Show that in case of proportional loading where $s_{ij}(t) = \mu(t)s_{ij}^0$, where s_{ij}^0 is a constant state of devatoric stress, the J_2 incremental theory of plasticity and the J_2 deformation theory of plasticity coincide.

3. Consider a thick cylinder under an internal pressure p. Considering plane strain determine the critical pressure p_c at which the cylinder first yields. Assume von Misces' yield criterion to hold. The inner radius of the cylinder is a and the outer radius is b.

   Next consider a that the internal pressure p exceeds p_c. Determine the radius c of the yielded zone. Note that the region between a and c will be yielded. Assume that the material of the cylinder is elastic-prfectly plastic.