Homework Assignment: Forging Load and Work Done Calculation

A solid cylindrical billet with initial diameter D_i and initial height H_i is compressed to a final height H_f between two flat dies during open-die forging. The strength coefficient is K, and the strain hardening exponent is n. The friction coefficient between the billet and the platens is μ. Assume that volume remains constant throughout deformation ($V_i = V_f$).

Calculate:

1. True strain
2. Instantaneous flow stress and mean (average) flow stress,
3. Final diameter of the billet,
4. Required maximum forging load without friction,
5. Required maximum forging load considering friction,
6. Total work done without friction,
7. Total work done considering friction.

Draw load-stroke diagram for with and without friction.