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GEORGIA INSTITUTE OF TECHNOLOGY

The George W. Woodruff
School of Mechanical Engineering

Ph.D. Qualifiers Exam - Fall Semester 1999

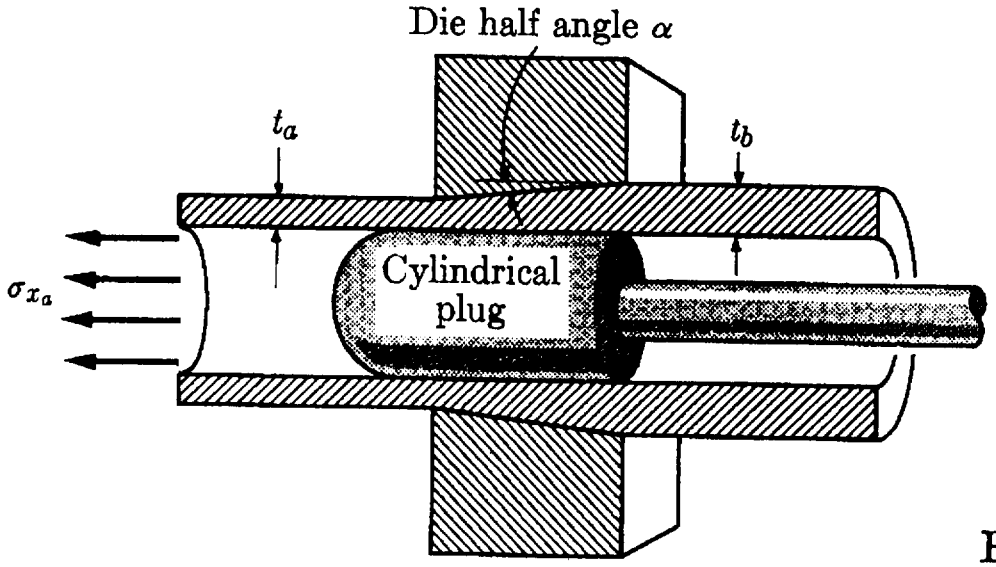
Manufacturing
EXAM AREA

Assigned Number **(DO NOT SIGN YOUR NAME)**

- **Please sign your name on the back of this page—**

Question #1

A tube drawing operation is illustrated in which a tube of radius r is drawn from thickness t_b to t_a. For a die half-angle α and a friction coefficient μ (same for die and plug), calculate the dimensionless drawing stress $\sigma_{xa}/2\tau_{flow}$.



FIG

Problem #2

For a single pass turning operation with the following conditions, determine the material removal rate, power, cutting force, and cost per part.

NOTE: A disposable insert is used. There is no idle or set up time.

feed rate (f) = 0.25 mm/revolution
depth of cut (d) = 5 mm
mean diameter of cut (D) = 80 mm
length of cut (L) = 250 mm
specific cutting energy (u) = 5 W-s/mm^3

Taylor's tool life equation: $V^3f^2T = 1 \times 10^7$

V in [meters/minute]
f in [mm/revolution]
T in [minutes]

tool changing time (t_c) = 7 minutes
cost / edge (D_g) = \$3.00
fully burdened machine rate (R_m) = \$0.65 / minute