Problem 109A

A shaft which is 2 cm in diameter and 20 cm long is concentrically located in a journal of the same length and 2.02 cm in diameter. The gap between the shaft and the journal is filled with oil whose dynamic viscosity is 0.1 $kg/m\ s$. Find the torque (in $kg\ m^2/s^2$) and the power (in $kg\ m^2/s^3$; note that 1 $watt = 1\ kg\ m^2/s^3$) required to turn the shaft at 6000 rpm (revolutions per minute). Note: treat this as a Couette flow neglecting the curvature of the gap geometry.