IC-W10D2-2 Table Problem Experiment 4 Conservation of Angular Momentum

A steel washer is mounted on the shaft of a small motor. The moment of inertia of the motor and washer is $I_r$. Assume the frictional torque on the axle is independent of angular speed. The washer is set into motion. When it reaches an initial angular velocity $\omega_0$, at $t = 0$, the power to the motor is shut off, and the washer slows down until it reaches an angular velocity of $\omega_a$ at time $t_a$. At that instant, a second steel washer with a moment of inertia $I_w$ is dropped on top of the first washer. The collision takes place over a time $\Delta t_{\text{col}} = t_b - t_a$.

a) What is the angular deceleration $\alpha_i$ while the washer and motor are slowing down during the interval $\Delta t_i = t_a$?

b) What is the angular impulse due to the frictional torque on the axle during the collision?

c) What is the angular velocity $\omega_b$ of the two washers immediately after the collision is finished (when the washers rotate together)?