Flipping Physics Lecture Notes:

Introductory Uniformly Angularly Accelerated Motion Problem

Example Problem: What is the angular acceleration of a compact disc that turns through 3.25 revolutions while it uniformly slows to a stop in 2.27 seconds?

Knowns: $\alpha = ?;\ \Delta\theta = 3.25 rev\left(\frac{2\pi rad}{1 rev}\right) = 6.5\pi\,\mathrm{rad};\ \omega_f = 0;\ \Delta t = 2.27\,\mathrm{sec}$

A compact disc will slow with a constant angular acceleration so we can use the Uniformly Angularly Accelerated Motion (UαM) equations. There is no UαM equation that has all four of our known variables in it, so we first need to solve for angular velocity initial.

$$\Delta\theta = \frac{1}{2}\left(\omega_f + \omega_i\right)\Delta t \Rightarrow 6.5\pi = \frac{1}{2}\left(0 + \omega_i\right)2.27 \Rightarrow \omega_i = \frac{(2)(6.5\pi)}{2.27} = 17.9915\frac{rad}{s}$$

And now that we have the initial angular velocity, we can solve for the angular acceleration.

$$\alpha = \frac{\omega_f - \omega_i}{\Delta t} = \frac{0 - 17.9915}{2.27} = -7.9258 \approx \boxed{-7.93\frac{rad}{s^2}}$$