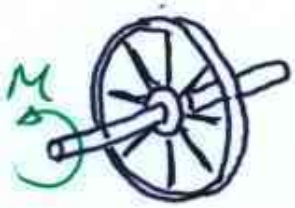
EXAMPLE: 6/124

50 kg FLYWHEEL; radius of gyration = 0.4m about shaft

TORQUE APPLIED: $M = 2(1 - e^{-0.1\theta})$ N·m θ in radians

@ $\theta = 0$, flywheel @ rest

after 5 revs whats ω?



ENERGY EQUATION:

$T_2 = T_1 + U_{1\to 2}$

- T_2: FINAL KIN. ENERGY
- T_1: KINETIC ENERGY @ START
- $U_{1\to 2}$: WORK DONE — NO POTENTIAL ENERGY

$T_1 = 0$ because $\omega = 0$ @ $\theta = 0$

find $U_{1\to 2}$

$$U_{1\to 2} = \int_1^2 M\,d\theta = \int_0^{10\pi} 2(1 - e^{-0.1\theta})\,d\theta$$

$$= \left[2\theta + 20e^{-0.1\theta}\right]_0^{10\pi}$$

$$= \left((2)(10\pi) + 20e^{-0.1(10\pi)}\right) - (20)$$

$I_G = mk_G^2$

$U_{1\to 2} = 43.7$ J $= T_2$

$$T_2 = \tfrac{1}{2} I_G \omega^2 = \tfrac{1}{2}(50)(0.4)^2\omega^2 = 4\omega^2$$

(m: 50, k_g^2: 0.4^2)

$\therefore\ 43.7 = 4\omega^2 \Rightarrow$ **$\omega = 3.31$ rad/s**