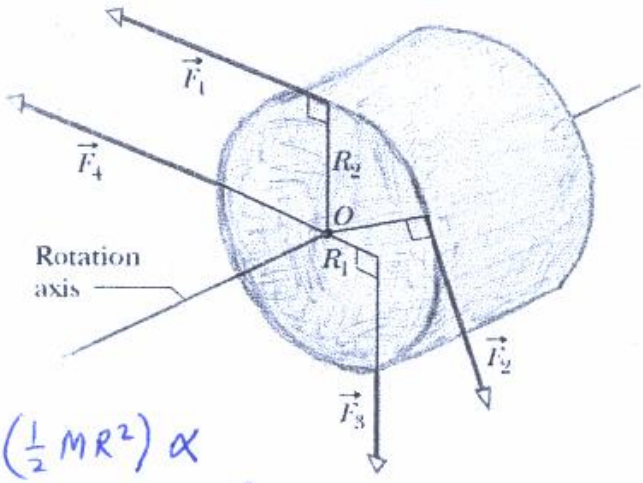
Key

Phys. 101 - Sec # 3 **(11)**

Name: ID # SN#

1- The mass of the cylinder is 2 kg and F1 = 6 N, F2 = 4 N, F3 = 2 N, F4 = 5 N. Also, R1 = 5 cm and R2 = 12 cm. Find the magnitude and direction of the angular acceleration of the cylinder.



$\vec{\tau}_{net} = I\vec{\alpha}$

$\vec{\tau}_1 + \vec{\tau}_2 + \vec{\tau}_3 + \tau_4 = I\alpha$

$F_1 R_2 - F_2 R_2 - F_3 R_1 + 0 = \left(\frac{1}{2}MR^2\right)\alpha$

$6(0.12) - 4(0.12) - 2(0.05) = \frac{1}{2}(\alpha)(0.12)^2\,\alpha$

$\alpha = \frac{0.14}{0.0144} = \boxed{9.7\ \frac{rad}{s^2}}$ (counterclockwise)

2- A disk has a rotational inertia of 6.0 kgm^2 and a constant angular acceleration of 2.0 rad/s^2. If it starts from rest, calculate the work done during the first 5.0 s by the net torque acting on it.

$I = 6.0\ kgm^2$

$\alpha = 2.0\ rad/s^2$

$\omega_0 = 0$

$t = 5\ s$

$\Delta\theta = \omega_0 t + \frac{1}{2}\alpha t^2$

$\Delta\theta = \frac{1}{2}(2)(25) = 25\ rad$

$W = \tau\,\Delta\theta$

$= (I\alpha)\,\Delta\theta$

$= (6)(2)(25)$

$= \boxed{300\ J}$