

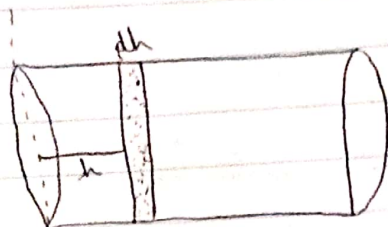
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PHYS - 230

LAB QUIZ #10

Ans. From the given data,

Consider a thin disc at distance 'h' of thickness 'dh' as shown below:-



The mass of thin disc is:-

$$dm = \rho \pi R^2 dh$$

$$= K \pi R^2 h^2 dh$$

Total mass is $M = \int_0^H dm$

$$\Rightarrow K \pi R^2 \int_0^H h^2 dh$$

$$\Rightarrow K \pi R^2 \frac{H^3}{3}$$

$$(a) \quad K = \frac{3M}{\pi R^2 H^3} = \frac{3 \times 3.56}{3.14 \times (0.49)^2 \times (1.23)^3}$$

$$= 9.441 \text{ kg/m}^5$$

(2)

(b) Inertia (dI) of the thin disc about the axis is
 $dI = dm r^2$

$$I = \int_0^H dI$$

$$= \int_0^H (K \pi R^2 h^2 d\theta) R^2$$

$$= K \pi R^2 \frac{H^3}{3}$$

$$I = \frac{9.441 \times 3.14 \times (0.44)^2 \times (1.23)^3}{3}$$

$$= \underline{\underline{3.2315 \text{ kg/m}^2}}$$

(c) Net Torque = 21.3 Nm - ~~10~~ fa

$$= 21.3 - (5.76)(0.18)$$

$$= \underline{\underline{20.2632 \text{ Nm}}}$$

Average acceleration, $\alpha = \frac{\tau}{I}$

$$= \underline{\underline{6.27 \text{ rad/sec}^2}}$$

$$\omega = \omega_i + \alpha t$$

$$= 0 + 6.27 (2 \times 60)$$

$$= \underline{\underline{752.46 \text{ rad/sec}}}$$

\therefore Angular velocity, $\omega = \underline{\underline{752.46 \text{ rad/sec}}}$