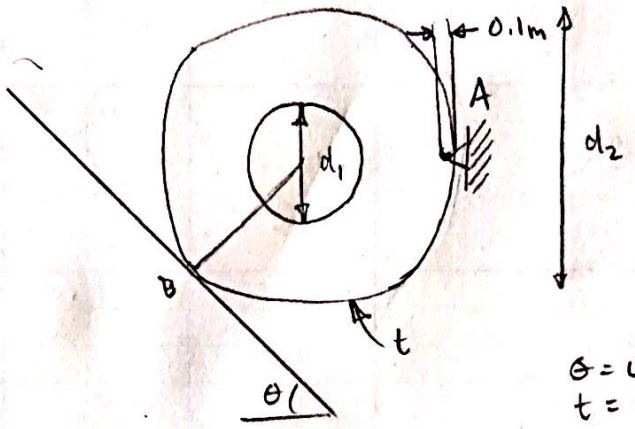
1. Given:



$\theta = 45°$ $\quad d_1 = 1m$

$t = 0.05m$ $\quad d_2 = 2m$

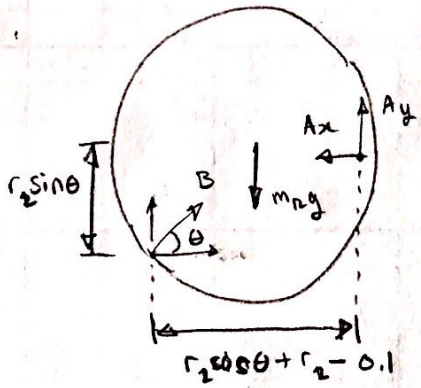
Find: reaction at B, R_B

Solution: $m_R = \rho \cdot V$, $V = (\pi r_2^2 - \pi r_1^2) \cdot t$, $\rho = 2.7 g/cm^3$

$$m_R = 2.7 g/cm^3 \cdot \pi((100cm)^2 - (50cm)^2) \cdot 5cm$$

$$\rightarrow m_R = 318 kg$$

FBD:



ΣF_y: $A_y + B\sin\theta - m_R g = 0$

ΣF_x: $B\sin\theta - A_x = 0$

ΣM_A: $+B\cos\theta(r_2\sin\theta) - B\sin\theta(r_2\cos\theta + r_2 - 0.1) + M_R g(r_2 - 0.1) = 0$

→ solve system:

$A_y = 913.7N$

$A_x = 2205.9N$

$B = 3119.6N$

→ $\boxed{R_B = 3119N \text{ @ } 45° \measuredangle}$

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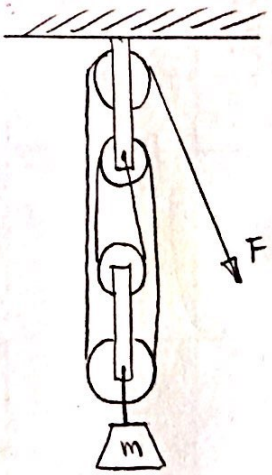
2. Given:



Find: $\bar{F}$

Solution: $\bar{F} = \bar{T}$ in cable

$W = mg$

from FBD, ΣF_y : $+4T - W = 0$

$T = \frac{W}{4}$

$T = \frac{mg}{4}$

$\rightarrow \boxed{|\bar{F}| = \frac{mg}{4}}$

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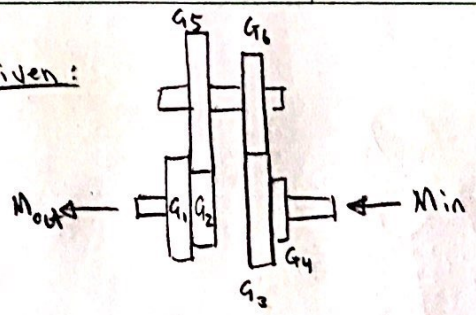
3.

Given:



$r_{G5} = 3r_{G2}$

$3r_{G3} = 5r_{G6} \rightarrow r_{G6} = \frac{5}{3} r_{G3}$

Find: a) overall gear ratio
b) M_{out}/M_{in}

Solution:

a) $G_R = \frac{r_{G3}}{r_{G6}} \cdot \frac{r_{G5}}{r_{G2}}$

$= \frac{5}{3} \cdot 3$

$\rightarrow \boxed{G_R = 5 \text{ or } 5:1}$

b) $M_{in} = G_R M_{out}$

$\frac{M_{out}}{M_{in}} = \frac{1}{G_R}$

$\frac{M_{out}}{M_{in}} = \frac{1}{5}$

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