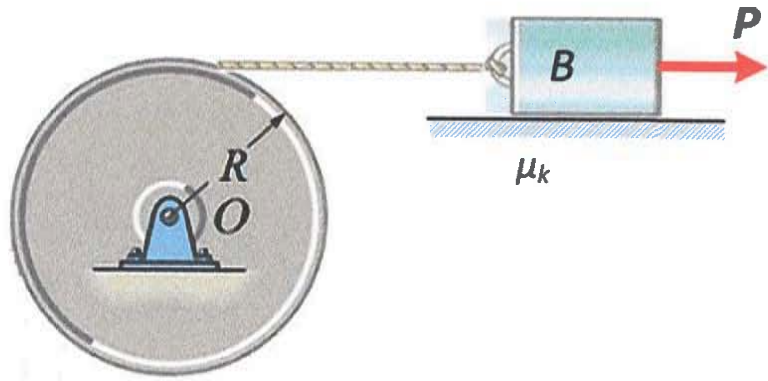


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Quiz 6a – EGM 3420C – Spring 2019

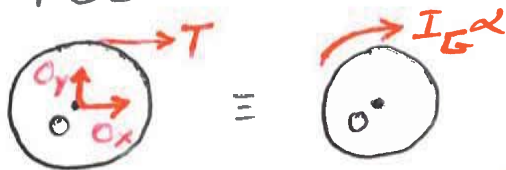
Problem 2 (6 Pts). The uniform thin disk has a mass $m_D = 20$ kg and radius $R = 0.5$ m. A cord of negligible mass is wrapped around the periphery of the disk and attached to a block B having a mass $m_B = 5$ kg. A force $P = 100$ N is applied as shown. Set $\mu_k = 0.15$.

- Determine the acceleration of block B .
- Determine the tension in the cable.



DISK (RAFA)

FBD \equiv KD

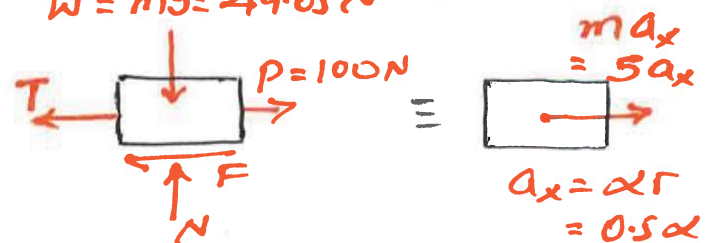


$$\uparrow 0.5T = \frac{1}{2}(20\text{ kg})(0.5\text{ m})^2\alpha$$

$$T = 5\alpha \quad \text{--- (1)}$$

BLOCK (TRANSLATION)

FBD \equiv KD



$$\uparrow -49.05 + N = 0$$

$$N = 49.05\text{ N}$$

$$\therefore F = 0.15(49.05) = 7.357\text{ N}$$

$$\rightarrow -T + 100 - 7.357 = 5(0.5\alpha)$$

$$T = 92.64 - 2.5\alpha \quad \text{--- (2)}$$

From eq (1) & (2)

$$5\alpha = 92.64 - 2.5\alpha$$

$$\alpha = 12.35\text{ rad/s}^2$$

From eq (1)

$$T = 5(12.35) = \underline{61.76\text{ N}} \quad (T) \quad \text{ANS (b)}$$

$$\therefore a_{\text{Block}} = a_x = 0.5(12.35) = \underline{6.175\text{ m/s}^2} \rightarrow \text{ANS (a)}$$

Answer: $a_{\text{Block}} = 6.175\text{ m/s}^2 \rightarrow T = 61.76\text{ N (T)}$