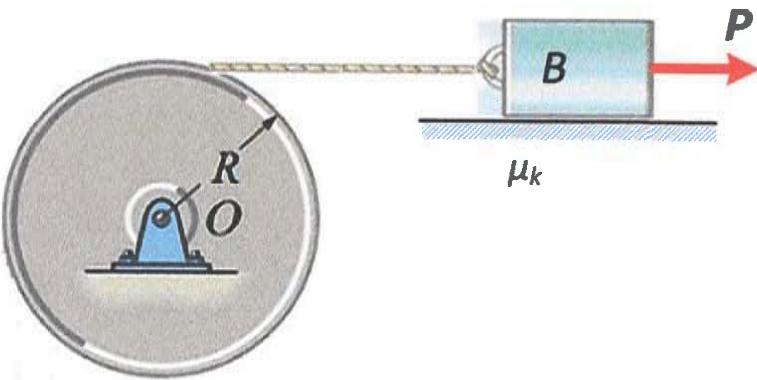


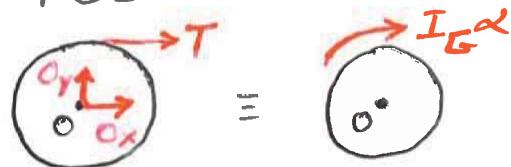
**Problem 2 (6 Pts).** The uniform thin disk has a mass  $m_D = 20 \text{ kg}$  and radius  $R = 0.5 \text{ m}$ . A cord of negligible mass is wrapped around the periphery of the disk and attached to a block  $B$  having a mass  $m_B = 5 \text{ kg}$ . A force  $P = 100 \text{ N}$  is applied as shown.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

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



### DISK (RAFA)

$$FBD \equiv KD$$

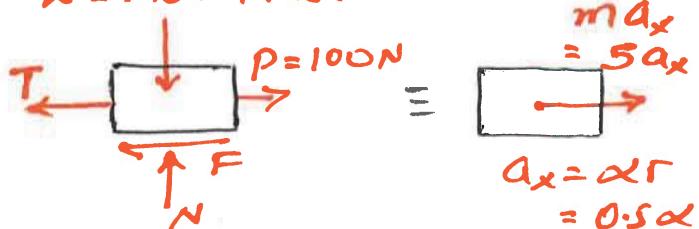


$$\vec{F} \cdot 0.5T = \frac{1}{2}(20\text{kg})(0.5\text{m})\alpha$$

$$T = 5\alpha \quad \dots \textcircled{1}$$

### BLOCK (TRANSLATION)

$$FBD \quad W = mg = 49.05 \text{N} \equiv KD$$



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

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

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

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

$$T = 92.64 - 2.5\alpha \quad \dots \textcircled{2}$$

From eq \textcircled{1} & \textcircled{2}

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

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

From eq \textcircled{1}

$$T = 5(12.35) = \underline{\underline{61.75}} \text{ N (T)} \text{ Ans (b)}$$

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

**Answer:**  $a_{\text{block}} = 6.175 \text{ m/s}^2 \rightarrow T = 61.75 \text{ N (T)}$