17.04.2024

RPM calculation:

outer diameter ⇒ 16 mm (of the timing belt pulley)

from certain sources we get the direct rpm an some sources provided steady state speed as $1 ms^{-1}$

$$\therefore \quad 1 ms^{-1} \Rightarrow \quad V = \omega r$$

$$1 = \omega \times (16 \times 10^{-3})$$

$$\omega = \frac{10^3}{16} = 62.5 \text{ rad s}^{-1}$$

$$\text{rpm} = \frac{62.5 \times 60}{2\pi} = 596.83 \text{ rpm}$$

due to dynamics of the motor as suggested by Sheil:

$$\text{rpm} \times 1.5 \quad \Rightarrow \quad 895.247 \text{ rpm} \approx 900 \text{ rpm}$$

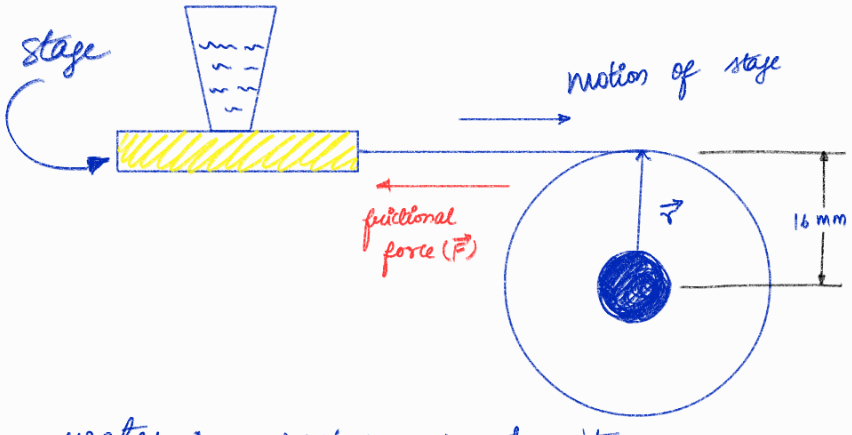
↓ experimental factor

Torque calculation:

$$\vec{\tau} = \vec{r} \times \vec{F}$$

$$\vec{F} = \mu_s \vec{N}$$

$$\vec{N} = m\vec{g}$$



Let's assume 250 mL of water: volume × density

$$= 250 \text{ mL} \times \frac{1 \text{ gram}}{1 \text{ mL}}$$

$$m = 250 \times 10^{-3} \text{ kg}$$

$$\vec{\tau} = (16 \times 10^{-3})(250 \times 10^{-3})(10)$$

$$\vec{\tau} = 0.04 \text{ Nm} \times 1.5 \leftarrow \text{experimental factor}$$

$$\vec{\tau} = 0.06 \text{ Nm}$$