

$T_{load}$  = Tension in rope due to weight

P = Point where rope attaches to Spool

$T_2$  = Tension at point P

$T_m$  = Motor torque

for constant angular velocity

$$T_m = T_2 \cdot R$$

From Capstan

$$T_{load} = T_2 e^{\mu \theta}$$

$$T_2 = \frac{T_{load}}{e^{\mu \theta}}$$

$$T_m = \frac{T_{load}}{e^{\mu \theta}} \cdot R$$

$$\downarrow T_{load} = Mg$$

