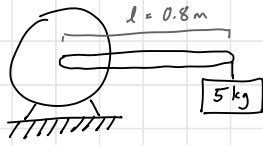


Ex 4) Basics of DC Motor Circuit

- For PMDC motor, answer the following questions
 - a) When driven at 750 rpm, the **armature back EMF** voltage is 55 V. What is the emf constant?
 - b) Suppose the machine was at rest with 5 kg loaded at 80 cm distance from the shaft of the motor. How much current is required to hold the bar horizontal?
 - c) When it runs drawing 25A from a 110 V DC supply, the speed is 1430 rpm. Calculate the armature resistance.
 - d) What is the no-load speed of this motor for 50 V of supply voltage?

$$\underline{a.} \quad k_e \omega = E \Rightarrow k_e = \frac{E}{\omega} = \frac{55 \text{ V}}{750 \times \frac{2\pi}{60}} = 0.7 \left[\frac{\text{V}}{\text{rad/s}} \right]$$

b.



$T = mgl$
 $k_t i = T \Rightarrow i = \frac{T}{k_t} = \frac{5 \times 9.8 \times 0.8}{0.7} = 56.06 \text{ A}$

c.

$$V = iR + k_e \omega$$
$$R = \frac{V - k_e \omega}{i} = \frac{(110 - 0.7 \times 1430 \times \frac{2\pi}{60})}{25} = 0.2 \Omega$$

d.

$$T = -\frac{k_t k_e}{R} \omega + \frac{k_t}{R} V = 0$$

$$\omega = \frac{V}{k_e} = \frac{50}{0.7} = 71.3674 \text{ rad/s} = 681 \text{ rpm}$$