

P2 - ELt 340 - Conversão

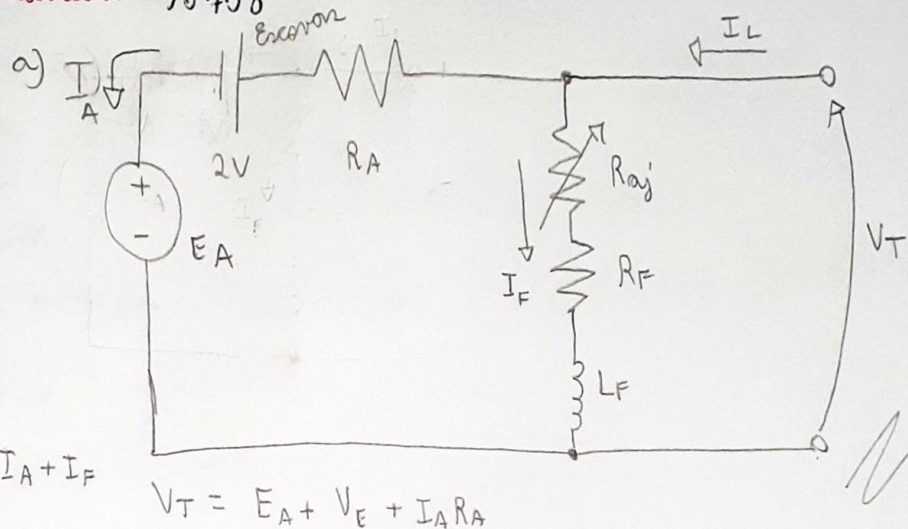
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①

Motor CC {
2,1 kW
200 V
1800 rpm
 $I_A = 10 A$
 $I_F = 0,5 A$
Shunt
 $V_E = 2 V$



$$I_F = \frac{V_T}{R_F + R_{aj}}$$

$$I_L = I_A + I_F$$

$$V_T = E_A + V_E + I_A R_A$$

b) $P_{im} = V_T I_L = 200 \times 10,5 = 2100 W$

$$P_E = V_E I_A = 2 \times 10 = 20 W //$$

$$P_A = I_A^2 R_A = 10^2 \times 2,4 = 280 W //$$

$$P_F = I_F^2 R_F = 0,5^2 \times 400 = 100 W //$$

$$P_s = \frac{P_{im}}{100} = 21 W //$$

$$P_T = V_{cezo} \times I_A = 200 \times 1 = 200 W //$$

$$R_A = \frac{V_T - E_A - V_E}{I_A} = \frac{200 - 2}{10} = \frac{198}{10} = 19,8 \Omega$$

$$E_A = K \Phi \omega \rightarrow \text{motor bloqueado} \rightarrow \omega = 0 \rightarrow E_A = 0 V$$

$$R_{aj} + R_F = \frac{200}{0,5} = 400 \Omega$$

$$P_{out} = P_{im} - P_E - P_A - P_F - P_s - P_T =$$

$$= 2100 - 20 - 280 - 100 - 21 - 200$$

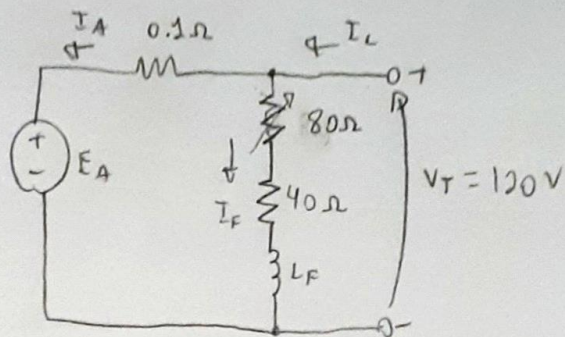
$$P_{out} = 1479 W //$$

c) $\eta = \frac{P_{out}}{P_{im}} \times 100\% = \frac{1479}{2100} \times 100\% = \frac{1479}{21} = 70,43\%$

②

Motor CC

- 10 kW
- 120 V
- 1000 rpm
- $I_A = 100 \text{ A}$
- $R_A = 0.1 \Omega$
- $R_F = 40 \Omega$
- $R_{aj} = 80 \Omega$
- $R_{aj} = [0, 200] \Omega$
- sem resis de armadura



$$I_F = \frac{120}{120} = 1 \text{ A pelo Tabela } E_{A0} = 100 \text{ V}$$

a) $I_A = I_L - I_F = 100 \text{ A} \rightarrow$

$$E_A = V_T - I_A R_A = 120 - 100 \times 0.1 = 110 \text{ V}$$

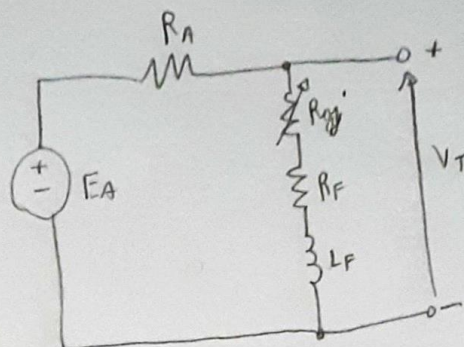
$$\frac{n_1}{n_0} = \frac{E_{A1}}{E_{A0}} \Rightarrow n_1 = \frac{E_{A1}}{E_{A0}} n_0 = \frac{110}{100} \times 1000 \text{ rpm} = 1100 \text{ rpm} \checkmark$$

b) $P = \tau_{ind} \omega_m = E_A I_A$

$$\tau_{ind} = \frac{P}{\omega_m} = \frac{10 \text{ K}}{1100 \times \frac{2\pi}{1} \times \frac{1}{60}} = 86,81 \text{ N.m} \checkmark$$

③

Motor CC
 Shunt
 20Hp
 240V
 75A
 $R_A = 0,12 \Omega$



$$I_A' = 2,5 I_A$$

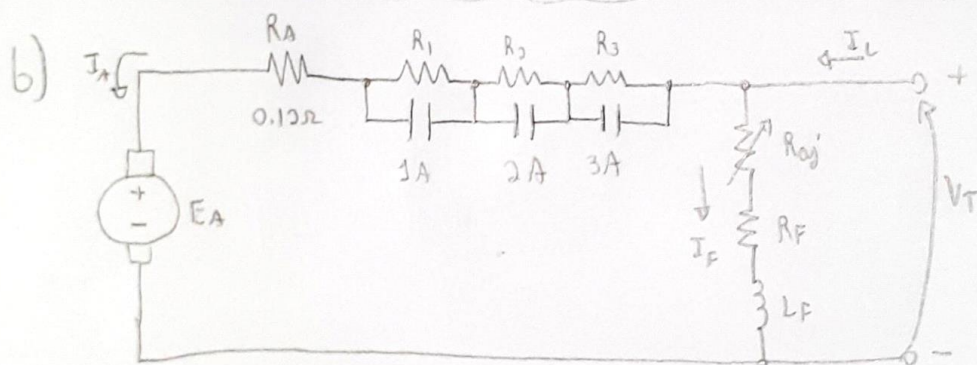
$I_A' \rightarrow$ corrente máxima

a) O número de estágios pode ser obtido por meio da seguinte equação:

$$n = \frac{\log(R_A/R_t)}{\log(I_{min}/I_{max})} = \begin{cases} I_{min} = 75A \\ I_{max} = 75 \times 250 = 187,5 A \\ R_A = 0,12 \Omega \\ R_t = 1,28 \end{cases}$$

$$R_t = \frac{V_T}{I_{max}} = \frac{240}{187,5} = 1,28 \Omega$$

$$n = \frac{\log(0,12/1,28)}{\log(75/187,5)} = 2,58. \text{ Portanto, serão necessários 3 estágios.}$$



c)
 $R_t = R_A + R_1 + R_2 + R_3 = 1,28 \Omega \rightarrow$ Valor da Resistência em cada estágio.

$$\text{Valor nominal de } E_{A2} = V_T - I_A R_t = 240 - 75 \times 1,28 = 144V$$

$$R_A + R_2 + R_3 = \frac{V_T - E_{A2}}{I_{max}} = \frac{240 - 144}{187,5} = 0,512 \Omega \rightarrow R_1 = R_t - (R_A + R_2 + R_3) = 0,768 \Omega$$

$$E_{A2} = V_T - I_A (R_A + R_2 + R_3) = 201,6V \rightarrow R_A + R_3 = \frac{V_T - E_{A2}}{I_{max}} = 0,205 \Omega \rightarrow R_2 = 0,307 \Omega$$

$$R_3 = R_t - R_A - R_1 - R_2 = 1,28 - 0,12 - 0,768 - 0,307 = 0,085 \Omega$$

③

③ d)

