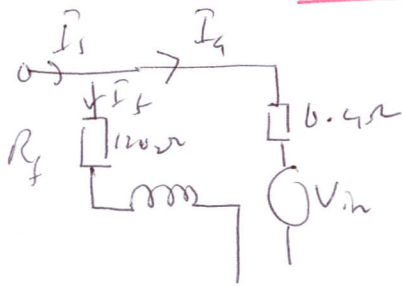


L2B21

Assgn 6.

$$n = 1200 \text{ r/min}$$

$$P_{\text{Loss mech}} = 240 \text{ W}$$

$$I_f = 19.5 \text{ A}$$

$$I_f = \frac{V_f}{R_f} = \frac{120}{120} = 1 \text{ A}$$

$$I_m = I_f - I_f = 19.5 - 1 = 18.5 \text{ A}$$

$$V_m = V_s - I_m R_a = 120 - 18.5 \times 0.4 = 112.6 \text{ V}$$

$$a) P_e = V_m I_m = 112.6 \times 18.5 = \underline{2083.1 \text{ W}}$$

$$b) P_{\text{out}} = P_e - P_{\text{Loss mech}}$$

$$= 2083 - 240 = \underline{1843.1 \text{ W}}$$

$$c) T = \frac{P_{\text{out}}}{2\pi n} = \frac{1843.1}{2\pi \times 1200/60} = \underline{14.7 \text{ Nm}}$$

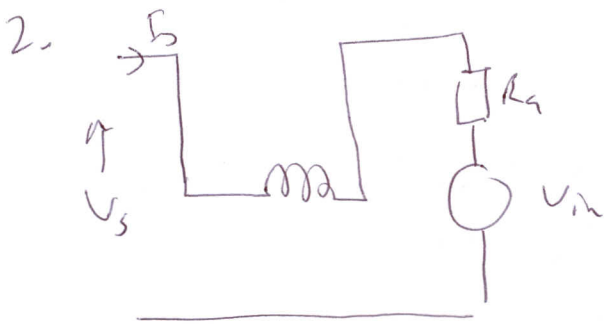
$$d) \eta = \frac{P_{\text{out}}}{P_{\text{in}}} = \frac{P_{\text{out}}}{P_e + I_m^2 R_a + V_s^2 / R_f}$$

$$= \frac{1843.1}{2083.1 + 18.5^2 \times 0.4 + 120^2 / 120} = \frac{1843.1}{2340} = 0.79$$

$$= \underline{79\%}$$

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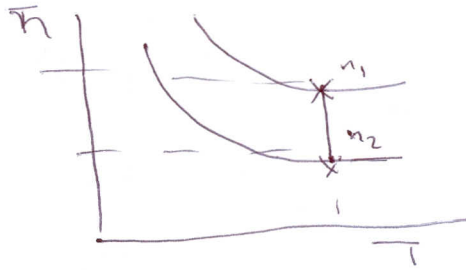


$$\begin{aligned} I_S &= 40 \text{ A} \\ n_1 &= 6 \text{ m/s} \\ n_2 &= 6 \text{ m/s} \\ R_A &= 0.48 \Omega \end{aligned}$$

$$T = k_1 I_A^2$$

$$T_1 = T_2 = T$$

$$\therefore I_{A1} = I_{A2} = I_A$$



$$V_{in1} = k n_1 = 460 - 40 \times 0.48 = 440.8$$

$$k = 440.8 / 6$$

$$V_{in2} = k n_2 \rightarrow V_{in} = 440.8 / 6 \times 4$$

$$V_S = V_{in2} + I_{A2} R_A$$

$$\overset{= 460}{460} = \frac{440.8}{6} \times 4 + 40 \times R_S$$

$$R_S = \frac{1}{40} \left( 460 - 440.8 \times \frac{4}{6} \right) = 4.15 \Omega$$

$$R_{\text{ext}} = R_S - R_A = 4.15 - 0.48 = \underline{3.67 \Omega}$$