Exercice 2 :

Un moteur asynchrone $p = 2$ (4 pôles)

1 enroulement statorique $\Rightarrow U = 380\,V$.

- $R_{\text{entre phases}} = 1,5\,\Omega$
- Essai à vide : $P_0 = 210\,W$ $I_0 = 1,5\,A$.
- Au point nominal : $U = 380\,V$
  $I = 4,7\,A$
  $P = 2500\,W$
  $n = 1410\ tr.min^{-1}$

1. Un enroulement sera branché entre deux phases, le couplage sera **TRIANGLE**

2. $n_s = 1500\ tr.min^{-1}$

3. Fonctionnement à vide :

a) $\cos\varphi_0 = \dfrac{P_0}{\sqrt{3} \times U I_0}$

$\cos\varphi_0 = \dfrac{210}{\sqrt{3} \times 380 \times 1,5}$

$\cos\varphi_0 = 0,212$

b) On note que $P_{\text{magn}} = P_{\text{méca}}$ à vide

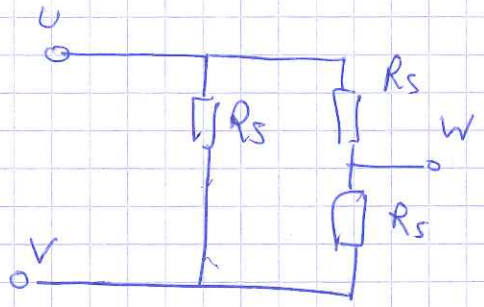
$P_0 \Rightarrow P_{Js\,tat} + P_{fer\,stat} + P_{méca}$; P_{tr} ; $P_u = 0\,W$ à vide

On note que

$$P_0 = P_{Jstat} + 2.P_{fer} \quad (P_{meca} = P_{fer})$$

$$\Rightarrow P_{Jstat} = 3 \times R_s \times I_0^2$$

$\Rightarrow$



$$R_{ph/ph} = \frac{R_s \times 2R_s}{R_s + 2R_s} = \frac{2R_s^2}{3R_s}$$

$$R_s = \frac{3}{2} \cdot R_{ph/ph} = \frac{3}{2} \times 1,5 = 2,25\ \Omega$$

$$P_{Jstat} = 3 \times 2,25 \times 1,5^2$$

$$P_{Jstat} = 15,18\ W$$

$$P_{meca} = P_{fer} = \frac{P_0 - P_{Jstat}}{2}$$

$$= \frac{210 - 15,18}{2} = 97,41\ W$$

Exercice (Suite)

4° Point nominal.

a) $g_N = ?$

$$g_N = \frac{1500 - 1410}{1500}$$

$$\boxed{g_N = 0,06}$$

$$f_{rot_N} = g \times f_s$$

$$= 0,06 \times 50 = 3\,Hz$$

$$\boxed{f_{rot_N} = 3\,Hz}$$

b) perte Jotat

$$P_{Jot_N} = 3 R_s \times I_N^2 = 3 \times 9,95 \times 4,7^2$$

$$= 149,1\,W$$

$$\boxed{P_{Jotat_N} = 149,1\,W}$$

c)

$$Pa \longrightarrow P_{Tr} \longrightarrow Pu$$

P_{Jst} $P_{fer\,st}$ P_{Jrot} P_{meca}

$$P_{Jrot} = g \times P_{Tr} = g(P_{ab} - P_{Jst} - P_{fer\,st})$$

$$= 0,06.(2500 - 149,1 - 97,41)$$

$$\boxed{P_{Jrot} = 135,2\,W}$$

d

$$P_u = P_{tr} - P_{Jrot} - P_{meca}$$

$$= P_{ab} - P_{Jst} - P_{fer\,st} - P_{Jrot} - P_{meca}$$

$$P_u = 2500 - 149,1 - 97,41 - 135,2 - 97,41$$

$$\boxed{P_u = 2020,88\ W}$$

$$T_u = \frac{P_u}{\Omega} = \frac{2020,88}{\frac{2\pi \cdot 1420}{60}} = \frac{2020,88}{147,65}$$

$$\boxed{T_u = 13,68\ Nm}$$

e.

$$\eta = \frac{P_u}{P_{abs}} = \frac{2020,88}{2500}$$

$$\boxed{\eta = 0,808}$$

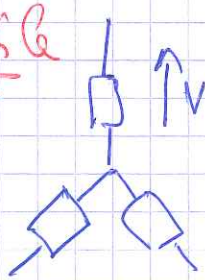
5 en démarrage direct $I_d = 15\ A$ et $T_d = 24\ Nm$

sous $U_{enroulent} = 380\ V$ en Triangle

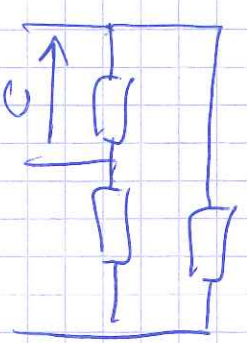
en étoile $U_{enroulent} = V = 230 = \frac{380}{\sqrt{3}}$

On sait que le couple est dépendant de P_{abs}.

En Etoile



En triangle



$$P_\lambda = 3 \times \frac{V^2}{Z} \times \cos\varphi$$

$$= 3 \times \frac{\left(\frac{U}{\sqrt{3}}\right)^2}{Z} \times \cos\varphi$$

$$P_\Delta = 3 \times \frac{U^2}{Z} \cos\varphi$$

$$\Rightarrow P_\lambda = \frac{P_\Delta}{3} \Rightarrow \boxed{T_{d\lambda} = \frac{T_{d\Delta}}{3} = \frac{24}{3} = 6\ Nm}$$