① Correction série 4 : Moteur asynchrone

Ex 01 :

1°/ moteur 230V/400V

a) réseau 130/230V - 50Hz

$U_{mot} = \underline{\underline{230V}} = U_{réseau}$ ⟹ Couplage triangle

b) réseau triphasé 230/400V

$U_{mot} = \frac{U_{réseau}}{230V}$ ⟹ couplage étoile

2°/ a) Pabsorbée : $P_a = U I \sqrt{3} \cos\varphi$

$P_a = 400 . I \times 0,78 \times \sqrt{3} = \frac{P_u}{\eta} = \frac{15}{0,78}$

$P_a = 18,75 \text{ kW}$

b) $I = \frac{P_a}{U\sqrt{3}\cos\varphi} = \frac{18750}{400\sqrt{3} \times 0,78} = 34,70$

c) $n_s = \frac{f}{p} = \frac{50}{p} = \frac{3000 \text{ tr/min}}{p}$

p	1	2	3	4
n_s (tr/min)	3000	1500	1000	750

$n < n_s$ ⟹ $n_s = 1500 \text{ tr/min}$ pour $n = 1430 \text{ tr/min}$

et $p = 2$

glissement : $g = \frac{n_s - n}{n_s} = \frac{1500 - 1430}{1500}$

$g = 4,66\%$

d°) $T_u = \frac{P_u}{\Omega} = \frac{15000}{2\pi \cdot \frac{n}{60}} = \frac{15000 \times 9,55}{1430}$

$T_u = 100,2 \text{ Nm}$

$\frac{2\pi}{60} = \frac{1}{9,55}$

Exo2

1°/ $n_s = \frac{f}{p} = \frac{50}{3} = 16,67 \text{ tr/s} = 16,67 \times 60 \text{ tr/min}$

$\boxed{n_s = 1000 \text{ tr/min}}$

2°/ moteur : 400V/660V } $U_{mot} = U_{réseau}$ ⇒ couplage triangle
réseau : 230V/400V }

3°/

a) $J = 10A$

b) $I = 17,3A$ couplage triangle

(couplage Y)

4) $P_a = U I \sqrt{3} \cos\varphi = 3 U J \cos\varphi$

$P_a = 3 \times 400 \times 10 \times 0,8 = 9,6 \text{ kW}$

5°/ $p_{JS} = \frac{3}{2} R I^2 = \frac{3}{2} \times 1,5 \times 17,3^2$

$\boxed{p_{JS} = 673,4 \text{ W}}$

6°/ $P_u = P_a - p_{JS} - \text{pertes} = 9600 - 673 - 833$

$P_u = 8094 \text{ W}$

$T_u = \frac{P_u}{\Omega} = \frac{8094}{2\pi \cdot \frac{n}{60}} = \frac{8094}{2\pi \times \frac{960}{60}} = 80,5 \text{ Nm}$

$\boxed{T_u = 80,5 \text{ Nm}}$

Exercice3

1°/ $P_a = U I \sqrt{3} \cos\varphi = 660 \times 10 \times \sqrt{3} \times 0,8$

$P_a = 8916 \text{ W}$

2°/ $p_{JS} = 3 R_s I^2 = 3 \times 1,8 \times 10^2 = 480 \text{ W}$

3°/ $P_{tr} = P_a - p_{JS} - p_{fs} = 8916 - 480 - 470$

$\boxed{P_{tr} = 7966 \text{ W}}$

③ 4°/ $n_s = \frac{f}{p} = \frac{50}{4} = 12,5 tr/s = 750 tr/mn$

il y a 8 pôles $\Rightarrow p = 4$

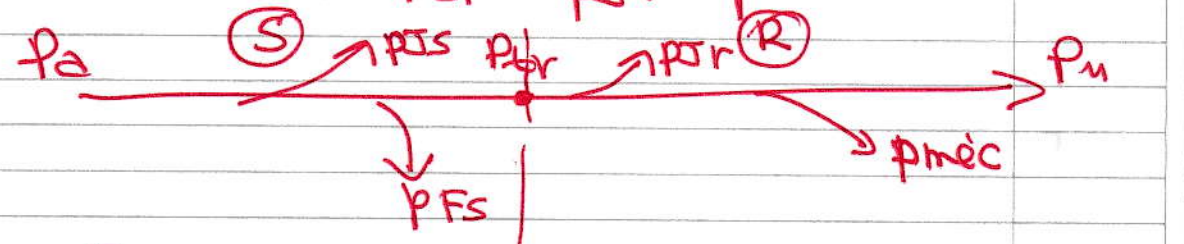
$g = \frac{n_s - n}{n_s} = \frac{750 - 720}{750} = 0104$

$\boxed{g = 4\%}$

5°/ $P_{JR} = g \times P_{tr} = 0104 \times 7966$

$\boxed{P_{JR} \simeq 319 W}$

6°/ $P_u = P_{tr} - P_{JR} - P_{méc}$



$P_u = 7966 - 319 - 330 = 7317 W$

$T_u = \frac{P_u}{\Omega} = \frac{7317}{2\pi \frac{n}{60}} = \frac{7317}{2\pi \times \frac{720}{60}} = 97 Nm$

7e/ $\eta = \frac{P_u}{P_a} = \frac{7317}{8916} = 82\%$

8°/ $\cos\varphi' = 0196$

La nouvelle puissance réactive ?

$Q' = Q \times \tan\varphi' \Rightarrow$ on calcule Q'

$(Q = P_{ax} \tan\varphi)$ $\varphi = \cos^{-1}(0178)$

$\Rightarrow Q' = Q + Q_C \Rightarrow Q_C = Q' - Q$

$Q_C = 3U^2 C_\Delta \omega \Rightarrow C_\Delta = \frac{Q_C}{3U^2\omega}$

$C_\Delta = \frac{P_x(\tan\varphi - \tan\varphi')}{3U^2\omega} = \frac{8916.(\tan\varphi - \tan\varphi')}{3 \times 660^2 \times 314}$

$\varphi = \cos^{-1}(0,78)$, $\varphi' = \cos^{-1}(0196)$

$\boxed{C_\Delta = 11 \mu F}$

9e/ $I'_2 \frac{P_a}{U\sqrt{3}\cos\varphi'} = \frac{8916}{660 \times \sqrt{3} \times 0196} = 8,12 A$