Corrigé type - TECHNOLOGIE DES Turbomachines

EXERCICE N°1 (4 pts).

$$\eta_h = \frac{H_m}{H_{th}} \quad (1)$$

$$H_{th} = \frac{U_2 V_{2u} - U_1 V_{1u}}{g} = \frac{U_2 V_{2u}}{g} \quad (1)$$

($V_{1u} = 0$)

$$U_2 = R_2 \omega = \frac{D_2}{2} \cdot \frac{2\pi N}{60} = 65,973 \text{ m/s} \quad (0,5)$$

$$V_{2u} = V_2 \cos\alpha_2 = 3 \text{ m/s} \quad (0,5)$$

$$H_{th} = \frac{65,973 \times 3}{9,81} = 20,16 \text{ m/s} \quad (0,5)$$

$$\eta_h = \frac{17}{20,16} = 0,843 \text{ soit } 84,3\ \% \quad (0,5)$$

EXERCICE N°2 (06 pts).

Théorème de Rateau.

$$\frac{N_1}{N_2} = \frac{Q_1}{Q_2} \rightarrow Q_2 = Q_1 \frac{N_2}{N_1} = 305,26 \text{ l/s} \quad (3 \text{ pts})$$

$$\frac{H_1}{H_2} = \left(\frac{N_1}{N_2}\right)^2 \Rightarrow H_2 = H_1 \left(\frac{N_2}{N_1}\right)^2 = 58,24 \text{ m} \quad (3 \text{ pts})$$

Exercice N° 3 (10 pts)

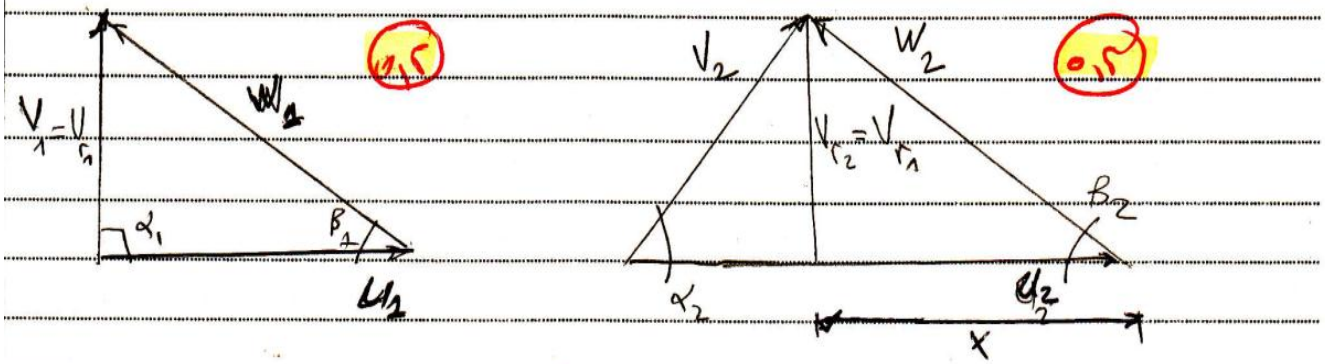
$$\eta_h = \frac{H_m}{H_{th}} \rightarrow H_m = \eta_h H_{th} \quad (1)$$

$$H_{th} = \frac{U_2 V_{2u} - U_1 V_{1u}}{g} = \frac{U_2 V_{2u}}{g} \quad (1)$$

($V_{1u} = 0$)

$$U_2 = R_2 \omega = \frac{D_2}{2} \cdot \frac{2\pi N}{60} = 22,77 \text{ m/s} \quad (0,5)$$

Suite Exercice n°3.



$V_{r_1} = U_1 \operatorname{tg} \beta_1 = 6,57 \text{ m/s}$ — 1

$U_1 = R_1 . \omega = 11,38 \text{ m/s}$ — 1

$V_{r_2} = V_{r_1} = 6,57 \text{ m/s}$ — 0,5

$V_{u_2} = U_2 - X = U_2 - \frac{V_{r_2}}{\operatorname{tg} \beta_2}$ — 0,5

$V_{u_2} = 8,68$ — 0,5

$H_{th} = \frac{22,77 \times 8,68}{9,81} = 20,14 \text{ m.}$ — 0,5

$H_m = 0,82 \times 20,14 = 16,52 \text{ m.}$ — 0,5

$Q_v = V_{r_2} \pi D_2 b_2 = 123,67 . 10^{-3} \text{ m}^3/\text{s}$ — 3

$\eta_{hy} = \frac{\rho Q_v g H_m}{P_a} \Rightarrow P_a = \frac{\rho Q_v g H_m}{\eta_r} = 26,4 \text{ kW}$ — 1