Fluid Power Systems – Assignment #2

Division エネルギー環境システム専攻

Laboratory 原子炉工学研究室

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How to submit? Write your answers on this sheet and send me in pdf to murai@eng.hokudai.ac.jp
Japanese students: 日本語で回答しても構いません.

[Problem]

The power, L, produced by cascade of blades has been obtained in the lecture. Derive the power coefficient, η, which is defined by the ratio of L to the kinetic energy of flow in the upstream region. Use the tip-speed ratio, $\Gamma \fallingdotseq R\omega/w_z$, to simplify the function.

$$L = w\rho \frac{Q^2}{A} R \left(\tan\beta_1 - \tan\beta_2\right)$$

$$k = \frac{1}{2}\rho w_2^2 \left(\tan\beta_1 - \tan\beta_2\right)\left(\tan\beta_1 + \tan\beta_2\right)$$

$$\frac{L}{Tk} = \frac{2\rho Q^2}{A w_2 \left(\tan\beta_1 + \tan\beta_2\right)}$$