Consider a bandpass filter with a transfer function \( T(s) \) given by

\[
T(s) = \frac{\frac{a_1}{Q}}{s^2 + \frac{w_0}{Q} s + \frac{w_0^2}{Q}}
\]

- Calculate the magnitude of \( T(s) \) versus \( \omega \). The maximum is reached at \( w_0 \) and is equal to \( \frac{a_1}{w_0} \).
- Give an analytical expression of the two frequencies \( \omega_1 \) and \( \omega_2 \) at which \( |T(s)| = \frac{1}{\sqrt{2}} \).
- Using the analytical expressions of \( \omega_1 \) and \( \omega_2 \) and show that

\[
B = \omega_2 - \omega_1 = \frac{w_0}{Q}
\]

\[
T_{\text{max}} = \frac{a_1}{Q} \frac{1}{w_0}
\]