Homework 4	OD 7.9	04/20/21

Two-Component Model

$H_{rms} = \sqrt{\frac{1}{n} \Sigma_i H_i^2}$

$H_{max} = \sqrt{2}\, H_{rms} = \boxed{1.414 H_{rms} = H_{max}}$

$H_{1/10} = \left(\frac{2}{\pi} \cdot \frac{1}{\hat{H}}\right) \sqrt{2}\, H_{rms} \sin\left(\frac{\pi}{2} \cdot \hat{H}\right)$

$= \left(\frac{2}{\pi} \cdot 10\right) \sqrt{2}\, H_{rms} \sin\left(\frac{\pi}{2} \cdot \frac{1}{10}\right)$

$= 20/\pi \sqrt{2}\, H_{rms} \sin(\pi/20)$

$\boxed{H_{1/10} = 1.408 H_{rms}}$

$H_{1/3} = \left(\frac{2}{\pi} \cdot 3\right) \sqrt{2}\, H_{rms} \sin\left(\frac{\pi}{2} \cdot \frac{1}{3}\right)$

$= 6/\pi \sqrt{2}\, H_{rms} \sin(\pi/6)$

$\boxed{H_{1/3} = 1.350 H_{rms}}$

$H_1 = \left(\frac{2}{\pi} \cdot 1\right) \sqrt{2}\, H_{rms} \sin\left(\frac{\pi}{2} \cdot 1\right)$

$= 2/\pi \sqrt{2}\, H_{rms} \sin(\pi/2)$

$\boxed{H_1 = 0.9 H_{rms}}$

Rayleigh Distribution Method

$\hat{H} = H_{rms} \sqrt{\ln n/N}$, $H_p = H_{rms} \sqrt{\ln(1/p)}$

$H_{1/10} = H_{rms} \sqrt{\ln(1/1/10)}$

$= H_{rms} \sqrt{\ln 10}$

$\boxed{H_{1/10} = 1.517 H_{rms}}$

$H_{1/3} = H_{rms} \sqrt{\ln(1/1/3)}$

$= H_{rms} \sqrt{\ln 3}$

$\boxed{H_{1/3} = 1.048 H_{rms}}$

$H_1 = H_{rms} \sqrt{\ln 1/1}$

$= H_{rms} \sqrt{\ln 1}$

$\boxed{H_1 = 0 H_{rms}}$

$H_{max} = \sqrt{2}\, H_{rms} = \boxed{1.414 H_{rms} = H_{max}}$

The two methods will yield different results for each important wave height approximation. This is because they both use diffrent assumptions and analytical techniques. The two-component method analyzes two out-of-phase sinusoidal waves for its approximations. Rayleigh distribution is based of a much different probability model.