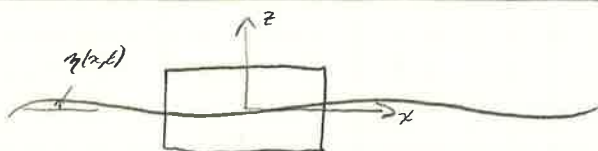


FREQ DOMAIN HEAVE RESPONSE OF FLOATING BODY



BODY POSITION: $z(t) = x_3(t) = \text{Re}[\xi_3 e^{i\omega t}]$
 VELOCITY: $\dot{z}(t) = \dot{x}_3(t) = \text{Re}[i\omega \xi_3 e^{i\omega t}]$
 ACCEL: $\ddot{z}(t) = \ddot{x}_3(t) = \text{Re}[-\omega^2 \xi_3 e^{i\omega t}]$

ξ_3 = COMPLEX HEAVE AMPLITUDE.

FORCES ACTING ON BODY

WEIGHT $F_3^w(t) = -mg$

HYDROSTATIC $F_3^{hs}(t) = \rho V g - \rho g S \text{Re}[\xi_3 e^{i\omega t}]$

RADIATION $F_3^r(t) = \text{Re}[\xi_3 e^{i\omega t} f_{33}]$ } ASSUMES NO CROSS COUPLING BETWEEN MODES.

$$f_{33} = \omega^2 a_{33} - i\omega b_{33}$$

$$= \text{Re}[\xi_3 e^{i\omega t} [\omega^2 a_{33} - i\omega b_{33}]]$$

a_{33} = ADDED MASS
 b_{33} = DAMPING
 REAL

EXCITING $F_3^E(t) = \text{Re}[A X_3 e^{i\omega t}]$

X_3 = COMPLEX WAVE EXCITING FORCE.

$$m \ddot{x}_3 = \sum F_3$$

THESE ARE FOR FLOATING BODY

$$\text{Re}[-m\omega^2 \xi_3 e^{i\omega t}] = \text{Re}[-mg + \rho V g - \rho g S \xi_3 e^{i\omega t} + \xi_3 e^{i\omega t} f_{33} + A X_3 e^{i\omega t}]$$

$$\xi_3 [-m\omega^2 + \rho g S - f_{33}] = A X_3$$

$$\frac{\xi_3}{A} = \frac{X_3}{-m\omega^2 + \rho g S - f_{33}} = \frac{X_3}{-\omega^2(m + a_{33}) + i\omega b_{33} + \rho g S} = \xi_3$$

RESONANCE

$$\begin{cases} -\omega^2(m + a_{33}) + \rho g S = 0 \\ \omega = \sqrt{\frac{\rho g S}{(m + a_{33})}} \end{cases}$$