EQUATIONS & CONVERSIONS

The following equations and conversions will be given as part of exams:

Densities of water at 59°F:	$\rho_{FW} = 1.94$ lb-s^2/ft^4	$\rho_{SW} = 1.99$ lb-s^2/ft^4
	$\rho g_{FW} = 62.4$ lb/ft^3	$\rho g_{SW} = 64$ lb/ft^3
Miscellaneous:	1 LT = 2240 lb	g = 32.17 ft/s^2
	1 ft^3 = 7.4805 gal	1 kt = 1.688 ft/s

$$A_{WP} = 2\int_0^L y(x)dx \qquad A_{Sect} = 2\int_0^T y(z)dz \qquad \nabla_S = \int_0^L A_{Sect}(x)dx \qquad LCF = \frac{2\int_0^L xy(x)dx}{A_{WP}}$$

$$\int y(x)dx = \frac{\Delta x}{3}\left(1y_0 + 4y_1 + 2y_2 + 4y_3 + 2y_4 + 4y_5 + \ldots + 4y_{n-1} + 1y_n\right)$$, n = even number

$$\Delta x = \frac{L_{pp}}{\#\ of\ stations - 1} \qquad F_B = \rho g \nabla \qquad TPI = \frac{A_{WP}(ft^2)}{420\left(\frac{in - ft^2}{LT}\right)} \qquad \delta T_{PS} = \frac{w}{TPI} \qquad \delta Trim = \frac{wl}{MT1''}$$

$$P_{hyd} = \rho g z \qquad P_{abs} = P_{atm} + P_{hyd} \qquad Trim = T_{aft} - T_{fwd} \qquad T_{mean} = \frac{T_{fwd} + T_{aft}}{2}$$

$$\overline{KM} = \overline{KB} + \overline{BM} = \overline{KG} + \overline{GM} \qquad \tan\phi = \frac{TCG}{GM_T} \qquad wt = \Delta\overline{GM}\tan\phi \qquad \delta T_{fwd/aft} = \frac{\delta Trim \times d_{fwd/aft}}{L_{PP}}$$

$$\overline{KG}_{new} = \frac{\overline{KG}_{old}\Delta_{old} + \sum \pm w_i \overline{Kg}_i}{\Delta_{old} + \sum \pm w_i} \qquad \overline{TCG}_{new} = \frac{\overline{TCG}_{old}\Delta_{old} + \sum(\pm w_i)(\pm \overline{Tcg}_i)}{\Delta_{old} + \sum \pm w_i}$$

$$T_{final,fwd/aft} = T_{initial,fwd/aft} \pm \delta T_{PS} \pm \delta T_{fwd/aft} \qquad FSC = \frac{\rho_t i_t}{\rho_S \nabla_S} \qquad i_t = \frac{lb^3}{12}$$, for rectangular shapes

$$\overline{G_1Z_1} = \overline{G_0Z_0} - \overline{GG_v}\sin\phi - \overline{G_vG_t}\cos\phi - FSC\sin\phi \qquad \overline{GZ} = \overline{GM_T}\sin\phi$$, for small angles

$$\overline{GM_{eff}} = \overline{GM} - FSC \qquad Righting\ Moment = \overline{GZ}\,\Delta$$

$$e = L_f - L_o \qquad \varepsilon = \frac{L_f - L_o}{L_o} \qquad \sigma = \frac{My}{I} \qquad \sigma = \frac{F}{A} \qquad E = \frac{\sigma}{\varepsilon}$$

$$\lambda = \frac{L_S}{L_M} \qquad \frac{V_M}{\sqrt{L_M}} = \frac{V_S}{\sqrt{L_S}} \qquad C_T = \frac{R_T}{\frac{1}{2}\rho S V^2} \qquad \eta_p = PC = \frac{EHP}{SHP} \qquad EHP = \frac{R_T V_S}{550\,\frac{ft-lb}{\sec - HP}}$$

$$R_n = \frac{LV}{\nu} \qquad F_n = \frac{V}{\sqrt{gL}} \qquad \eta_{prop} = \frac{2}{1 + \sqrt{1 + C_t}} \qquad C_t = \frac{T}{\frac{1}{2}\rho A_O V_A^{\,2}}$$

$$\omega = \frac{2\pi}{T} = \sqrt{\frac{k}{m}} \qquad \omega_e = \omega_w - \frac{\omega_w^{\,2} V_S \cos\mu}{g} \qquad \tan\theta = \frac{wl}{\Delta\overline{BG}}$$