5.6

$$t_f - t_0 = \int_{h_f}^{h_0} \frac{dh}{\frac{DV}{W}} = \int_{h_f}^{h_0} \frac{dh}{\frac{1}{2E^*}\left(u^2+\frac{1}{u^2}\right) V_* u}$$

$$= 2E^* \int_{h_f}^{h_0} \frac{1}{V^*} \frac{dh}{u^3 + \frac{1}{u}}$$

$$\left.\frac{\partial (t_f - t_0)}{\partial V}\right|_{h=Const} = 0 \Rightarrow \left.\frac{\partial (t_f - t_0)}{\partial u}\right|_{h=Const} = 0$$

$$3u^2 - \frac{1}{u^2} = 0 \qquad u = \frac{1}{\sqrt[4]{3}}$$

$$(t_f - t_0)_{max} = 2E^* \int_{h_f}^{h_0} \sqrt{\frac{\rho S_w C_L^*}{2W}} \frac{dh}{\frac{\frac{1}{3}+1}{\frac{1}{\sqrt[4]{3}}}} \qquad \sqrt[4]{3}\ \frac{4}{3}$$

$$= \cancel{2}E^* \sqrt{\frac{S_w C_L^*}{2W}} \frac{3}{\cancel{4}_2 \sqrt[4]{3}} \int_{h_f}^{h_0} \sqrt{\rho}\, dh$$

$$(t_f - t_0)_{max} = \frac{E^*}{V_s^*} \frac{3}{2\sqrt[4]{3}} \int_{h_f}^{h_0} \sqrt{\sigma}\, dh$$

$$X_f - X_0 = \int_{h_f}^{h_0} \frac{dh}{D/W} = \int_{h_f}^{h_0} \frac{dh}{\frac{1}{2E^*}\left(u^2+\frac{1}{u^2}\right)}$$

$$= 2E^* \frac{1}{\frac{4/3}{\frac{1}{\sqrt{3}}}} (h_0 - h_f)$$

$$X_f - X_0 = \frac{\sqrt{3}}{2} E^* (h_0 - h_f)$$