Practice Problem Set-5 Answers Table

ME-231A

P1. $\frac{gL}{V_o^{\,2}}, \frac{\mu}{V_o \rho L}$

P2. $\Pi_1 = \frac{\tau_w}{\rho u^2}, \Pi_2 = \frac{\mu}{\rho x U}, \Pi_1 = f\left(\Pi_2\right)$

P3. $\Pi_1 = \frac{\delta}{x}, \Pi_2 = \frac{\mu}{\rho x U}, \Pi_1 = f\left(\Pi_2\right)$

P4. $\Pi_1 = \frac{W}{g\rho p^3}, \Pi_2 = \frac{\sigma}{g\rho p^2}$

P5. (a) $\Pi_1 = \bar{u}\sqrt{\frac{\rho}{\tau_w}} = \frac{\bar{u}}{u^*}$

P6. (a) 4 , (b) 3, (c) $\Pi_1 = \frac{\mu}{\rho\sqrt{d^3 g}}$

P7. (a) 3, (b) $\Pi_1 = \frac{Q}{\rho V^3 L^2}, \Pi_2 = \frac{c_p \Theta}{V^2}, \Pi_3 = \frac{\mu}{\rho L V}$

P8. $\Pi_1 = \frac{F_T}{\rho V^2 D^2}, \Pi_2 = \frac{gD}{V^2}, \Pi_3 = \frac{\omega D}{V}, \Pi_4 = \frac{p}{\rho V^2}, \Pi_5 = \frac{\mu}{\rho D V}$

P9. $\Pi_1 = \frac{P}{\rho V^3 D^2}, \Pi_2 = \frac{c}{V}, \Pi_3 = \frac{\omega D}{V}, \Pi_4 = \frac{\mu}{\rho D V}$

P10. $\Pi_1 = \frac{m}{\delta\rho\alpha}, \Pi_2 = \frac{D}{\alpha}, \Pi_1 = f\left(\Pi_2\right)$

P11. $\Pi_1 = \frac{F}{\mu D V}, \frac{F}{\mu D V} = const.$

P12. (a) $\{k\} = \left\{\frac{1}{T}\right\}, \{D\} = \left\{\frac{L^2}{T}\right\}$ (b) $\frac{VL}{D} = peclet\ \ number$

P13. (a) 5m/s (b) 1.336×10^{-6}

P14. u=16.4m/s

P15. D_p = 0.151m

P16. (a) V_m=157ft/s, (b) F_p=5.8 lbf

P17. Pa=4.42atm