

8.1

$$D_r = \int p_{ad} dA + \int T_y dA \quad L_i = \int p_y dA + \int T_x dA$$

$$D_r = (2.3 - (1.2)) \times \sin 7^\circ \times 1 + (5.8 \times 10^{-2} + 7.6 \times 10^{-2}) \times \cos 7^\circ \times 1 = 559 \text{ N}$$

$$L_i = (2.3 - (1.2)) \times \cos 7^\circ \times 1 + (5.8 \times 10^{-2} + 7.6 \times 10^{-2}) \times \sin 7^\circ \times 1 = 3490 \text{ N}$$

8.5

$$C_D = \frac{D_r}{\frac{1}{2} \rho U^2 A} = \frac{300}{\frac{1}{2} \times 1.23 \times \left(\frac{90}{3.6}\right)^2 \times 2} = 0.39$$

↓
 ρ_{air}

(9 - 8 سوال)

$$\text{a) } R = D_r = \frac{1}{2} C_D \rho U^2 A = \frac{1}{2} (0.25) (1.23) (5)^2 (55) = 211.4 \text{ N}$$

$$\text{b) } U = \sqrt{U_x^2 + U_y^2} = \sqrt{(5)^2 + (2)^2} = 5.39 \text{ m/s}$$

$$\theta = \arcsin \left[\frac{5}{5.39} \right] = 68.1^\circ$$

$$R = \sqrt{D_r^2 + D_i^2} = \frac{1}{2} \rho U^2 A \sqrt{C_D^2 + C_i^2}$$

$$= \frac{1}{2} (1.23) (5.39)^2 (55 \sin(68.1^\circ)) \sqrt{(0.25)^2 + (0.6)^2} = 592.5 \text{ N}$$

(53 - 8 سوال)

$$Re = \frac{UD}{\nu} = \frac{2 \times 0.1}{1.12 \times 10^{-6}} = 1.8 \times 10^5 \rightarrow C_D = 0.51$$

$$\text{Parsian } D_r = \frac{1}{2} C_D \rho U^2 A = \frac{1}{2} (0.51) (1000) (2)^2 [(30 \times 0.1)] = 3060 \text{ N}$$

$$D_r + \frac{F}{B} = W$$

سوال 8 - 58) حساب حرکت صفر ←

$$\rightarrow \frac{1}{2} C_D \rho u^2 A = \gamma V \rightarrow \frac{1}{2} C_D \rho u^2 \left[\frac{\pi D^2}{4} \right] = \gamma \left[\frac{\pi D^3}{6} \right]$$

$$\rightarrow u = \sqrt{\frac{4 \gamma D}{3 C_D \rho}} = \sqrt{\frac{4 \times 9.81 \times 0.003}{3 C_D}} \Rightarrow u = \frac{0.198}{\sqrt{C_D}} \quad (*)$$

$$\rightarrow Re = \frac{u D}{\nu} = \frac{u (0.003)}{1.12 \times 10^{-6}} = 2678.6 u$$

← عدد رینولدز عدد نوسان است ← از شرط (1-8) C_D بیست آمده و با جدول مضامین ساله C_D مقابله کرد ←

با حالتی که در رابطه (*) گفته اند در حدی که C_D نامعین باشد و C_D معین می شود ←

$$C_D = 1.0 \rightarrow u = 0.2 \rightarrow Re = 531 \rightarrow C_D = 0.5$$

$$C_D = 0.5 \rightarrow u = 0.28 \rightarrow Re = 750 \rightarrow C_D = 0.5$$

$$P = PRT \Rightarrow 100 \times 10^3 = \rho \times 2.77 \times 278 \Rightarrow \rho = 0.17 \quad \text{حل ۴۳}$$

$$W = F_B + F_{D_r} = 140g + 0.17g \times \frac{\pi D^3}{6} = \frac{\pi D^3}{6} \times 1.239 + \frac{1}{2} \times C_D \rho \times 3^2 \times 1.2 \frac{\pi D^2}{4}$$

$\begin{matrix} 0.89 & & 0.64 & & 4.2 C_D D^2 \end{matrix}$

$$\Rightarrow 0.89 D^3 = 0.64 D^3 + 4.2 D^2 C_D \Rightarrow (0.89 - 0.64) D^3 = 4.2 D^2 C_D$$

$$\Rightarrow 0.25 D^3 = 4.2 D^2 C_D \Rightarrow D = 21.13 C_D$$

$$\frac{\text{طبق}}{۱۲} \rightarrow D = 6.44 \text{ and } C_D = 0.3$$

باقی از D :

$$\Rightarrow 21.13 \times 0.3 = 6.44 \quad \checkmark$$

$$\dot{w} = w D_r$$

سوال 8 - 69

$$\frac{\dot{w}_1}{\dot{w}_2} = 1 = \frac{u_1}{u_2} \times \frac{C_{D1}}{C_{D2}} \times \frac{u_1^2}{u_2^2} \rightarrow \frac{C_{D2}}{C_{D1}} = \frac{u_1^3}{u_2^3} = 0.82$$

$$\rightarrow \frac{u_1}{u_2} = \sqrt[3]{0.82} = 0.936 \rightarrow \frac{u_2}{u_1} = 1.068$$

← سرعت چرخها 7 درصد افزایش یافته است.

$$W = \frac{1.6}{2} = D_r \left(\frac{3.2}{2} + 1 \right) ; 0.8W = 1.3 C_D \rho U^2 A ; U \text{ در } \nu$$

$$\Rightarrow \frac{d}{D} = \frac{1.6}{3.2} = 0.5 ; C_D = 2.5$$

$$\Rightarrow 0.8 \times 190 \times 10^3 = 1.3 \times 2.5 \times 1.23 \times U^2 \times 12 \times 3.2$$

$$\Rightarrow U = 31.5 \text{ m/s}$$

$$M = \frac{l_1}{2} D_{r1} + \left(l_1 - \frac{D_2}{2} \right) D_{r2} \quad \text{①}$$

در 9 v

$$Re_1 = \frac{UD}{\nu} = \frac{20 \times 0.12}{1.46 \times 10^{-5}} = 1.64 \times 10^5 ; C_{D1} = 1.2 ; C_{D2} = 0.08$$

$$M = \frac{30}{2} \left(\frac{1}{2} \times 1.2 \times 1.23 \times 20^2 \times 30 \times 0.12 \right) +$$

$$\left(30 - \frac{2}{2} \right) \left(\frac{1}{2} \times 0.08 \times 1.23 \times 20^2 \times 2.5 \times 2 \right) \Rightarrow M = 18794 \text{ N.m}$$

$$D_r = \frac{1}{2} C_D \rho U^2 A = \frac{1}{2} \times 1.1 \times 1.23 \times 25^2 \times \frac{\pi}{4} \times 0.13^2 \quad \text{كل ٨٢}$$

$$= 5.6 \text{ N} \quad \text{and} \quad \xi = \frac{E_b}{\eta} = \frac{D_r l}{\eta} = \frac{5.6 \times 24000 \times 10^3}{0.3} = 4.49 \times 10^8$$

$$\text{سرعت} = \frac{m}{\rho} = \frac{E/\text{hr}}{\rho} = \frac{4.49 \times 10^5 / 44000}{800} = 0.0127 \text{ m/سك}$$

$$\text{سرعت} = 0.0127 \times 400 = 5.08 \text{ تومان/سك}$$

$$\text{مقدار مصرف سوخت} \sim \text{كاشف هزينه رايش} \Rightarrow \text{هزينه} = \frac{C_D \text{ زياده} + C_D \text{ زياده}}{C_D \text{ زياده}} = \frac{1.1 - 0.4}{1.1} = 0.7$$

$$\text{كاشف هزينه} = 0.7 \times 12.7 = 8.9 \text{ ليتر/سك}$$

$$\Rightarrow 0.7 \times \text{سرعت} \Rightarrow 0.7 \times 5080 \approx 3500 \text{ تومان در سال}$$