

HW 2.2 CHP 17

AIR @ 30°C

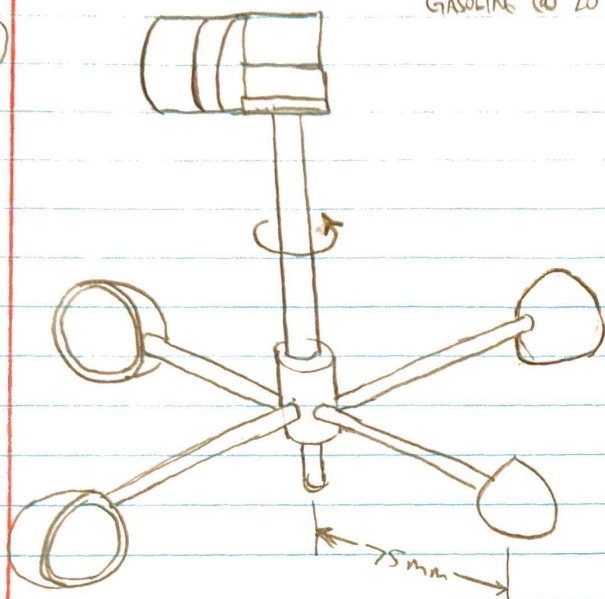
GASOLINE @ 20°C

$$1R/m = \frac{2\pi L}{60} \text{ m/s}$$

$$75 \text{ mm} = 0.075 \text{ m}$$

$$25 \text{ mm} = 0.025 \text{ m}$$

(11)



$$V = \frac{(20)(2\pi L)}{60}$$

$$V = \frac{(20)(2\pi)(0.075)}{60}$$

$$V = 0.157 \text{ m/s}$$

$$A = \frac{\pi D^2}{4}$$

$$A = \frac{\pi (0.025)^2}{4} = A = 4.91 \times 10^{-4} \text{ m}^2$$

$$N_R = \frac{VD}{\nu}$$

APPENDIX E

$$\nu = 1.6 \times 10^{-5} \text{ m}^2/\text{s}$$

$$N_R = \frac{(0.157)(0.025)}{1.6 \times 10^{-5}} = 245.31$$

$$C_D = 1.35 \text{ (TABLE, pg. 438)}$$

$$P_G @ 20^\circ\text{C} = 680 \text{ kN/m}^3$$

$$F_D = C_D \left(\rho V^2 / 2 \right) A$$

$$\frac{(1.35)(680 \times 0.157^2)(4.91 \times 10^{-4})}{2}$$

$$F_D = 0.0055 \text{ N}$$

$$T = 4F_D r$$

$$= 4(0.0055)(0.075)$$

$$T = 1.65 \times 10^{-3} \text{ N}\cdot\text{m}$$