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1 Problem 3

k = 1.8 c = 6 m/s

a)

$$c\Gamma\left(1+\frac{1}{k}\right),$$

$$6\Gamma(1.5),$$

$$\Gamma\left(1.5\right)=\frac{1}{2}*\sqrt{\pi},$$

$$3*\sqrt{\pi}=5.31\frac{m}{s}.$$

b)

F(u = 7.5) - F(u = 6.5) = [1- $e^{-\frac{7.5}{6}^{1.8}}$] − [1 − $e^{-\frac{6.5}{6}^{1.8}}$] = 0.091

As a portion of the year which is 8760 hours: 0.091*8760 = 794.19 hours or approximately 33 days.

c)

1 - F(u = 16)= 1 - [1- $e^{-\frac{16}{6}^{1.8}}$] = 0.0029

As a portion of the year which is 8760 hours: 0.0029*8760 = 25.36 hours or just over 1 day.

2 Problem 4

a)

$$F(u=10.5)-F(u=9.5)=[1-e^{-\frac{\pi}{4}\left(\frac{10.5}{6}\right)^2}]-[1-e^{-\frac{\pi}{4}\left(\frac{9.5}{6}\right)^2}]=0.049.$$

As a portion of the year which is 8760 hours: 0.049*8760 = 432.4 hours or approximately 18 days.

b)

$$1-F(u=16)=1-[1-e^{-\frac{\pi}{4}\left(\frac{16}{6}\right)^2}]=0.00375.$$

As a portion of the year which is 8760 hours: 0.00375*8760 = 32.88 hours or approximately 1.4 days.

3 Problem 5

$$P = \frac{1}{2}\rho A v^3 = \frac{1}{2} * 1.225 * 36\pi * 8^3 = 35467W.$$

Multiplied by the seconds in a year (3.154×10^7): $1.11 \times 10^{12} J = 308333$kWh

4 Problem 6

$$n = \frac{30}{7.5} f = 4f.$$

$$U* = \frac{0.4 * 7.5}{\ln\left(\frac{30}{0.05}\right)} = 0.47\frac{m}{s}.$$

$$\frac{fS(f)}{(2.5 * 0.47)^2} = \frac{11.4\,(4f)}{1 + 192.4\,(4f)^{\frac{5}{3}}}$$

,

$$S(f) = \frac{62.96}{1 + 1939.27 f^{\frac{5}{3}}}.$$

5 Problem 7

$$\frac{16.14 * 1.41}{1.33\times^{-5}} = 1711082.7.$$

$$\frac{75.08 * 0.35}{1.33\times^{-5}} = 1975789.47.$$

6 Problem 8

a.

u = 12m/s
$\rho = 1.41\frac{kg}{m^3}$
$r = 20m$
$\lambda = 7$
$c_l = 1$
$P_a = 1/2\rho(10^2\pi)(12)^3 = 382721.3834$ $C_p = \frac{100000}{382721.3834} = 0.26$