Solutions Manual

INTRODUCTION TO HYDROLOGY

FIFTH EDITION

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CHAPTER 1

1.1 $100*10^6*0.02 = 2*10^6$ m^3
1 acre-ft = 43,560 cubic feet
cubic meters*35.31 = cubic feet
$(2*10^6*35.31)/43,560 = 1,612.2$ acre-ft

1.2 volume/volume per unit time = time
(500,000*0.3)/(0.5) = 300,000 sec.
300,000/3,600 = 83.3 hours

1.3 (450 + 500)/2 - (500 + 530)/2 = avg. inflow - avg. outflow
the change in storage is thus - 40 cfs
-40*3600/43560 = -3.31, the change in storage in acre-ft.
The initial storage is thus depleted by 3.31 ac-ft
3.31*43,560/35.31 = 4,083 cubic meters

1.4 125/365 = 0.34 cm/day = 0.035 cm/day
0.34/2.54 = 0.13 in./day

1.5 volume = 5280*5280*0.5 = 13,939,220 cubic feet
V/Q = time
13,939,220*3600/12 = 1,161,600 sec, or 322.7 hr, or 13.4 days

1.6 ET = P - R
$R = (140*3600*24*365)/(10,.000*1000^2) =$
0.44 m/yr or 44 cm/yr
ET = 105 - 44 = 61 cm/yr
This is a crude estimate.

1.7 equivalent depth = vol/area
inflow = 25*3600*24*365 = 788,400 cubic feet/yr
inflow/(3650*43560) = 4.96 ft/yr
E = 100*365/3650 = 10.0 ft/yr
Hence there is a drop in level of 5.04 ft

1.8 Iavg. - Oavg. = change in storage per unit time
(20 - 18)*3600 = 7,200 cubic meters
The storage is thus increased by 7,200 cubic meters
resulting in a final storage of 27,200 cubic meters

CHAPTER 2

Problems in this chapter are to be developed by the instructor.

CHAPTER 3

3.1 – 3.4 To be assigned by instructor.

3.5 For the James River rainfall:

Interval in.	f	Σf	P(x)	F(x)
(36-37)	2	2	0.057	0.057
(38-39)	4	6	0.114	0.171
(40-41)	7	13	0.200	0.371
(42-43)	9	22	0.257	0.628
(44-45)	5	27	0.143	0.771
(46-47)	4	31	0.114	0.885
(48-49)	2	33	0.057	0.942
(50-51)	2	35	0.057	0.999 1.000

a) $P(MAR \geq 40) = 1.000 - 0.171 = 0.829 = 82.9\%$

b) $P(MAR \geq 50) = 0.057 = 5.7\%$

c) $P(40 \leq MAR \leq 50) = 0.942 - 0.171 = 0.771 = 77.1\%$

3.6 Using the curve data for a standard normal curve (Table B.1) requires standardization of the limits of the integral,

$$z = \frac{x - \bar{x}}{S} = \frac{8 - 4}{2} = 2$$

From Table B.1, the integral is the area to the right of F(z = 2), or 0.5 - 0.4772 = 0.0228.

3.7 For the data given:

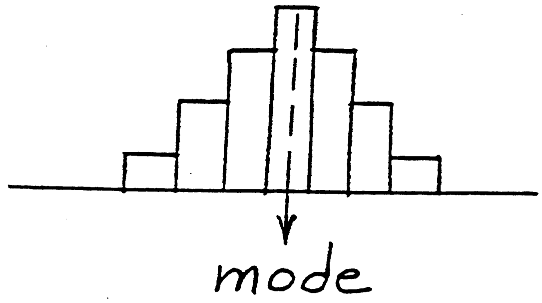
a) The area under the curve must be 1.0 to qualify as a probability density function,

$$A = \int_0^b f(x)dx = \frac{b^3}{8} \doteq 1.0$$

This gives b = 2.0

b) This is the area between 0.0 and 0.5, or $0.5^3/8 = 0.016$

3.8 The histogram is symmetric, has zero skew, and mean = median = mode.



Sketch for Prob. 3.8

Since area to right of mode is 50%, F(mode) = 50% and T = 2 yr.

3.9 Given $\bar{x} = 10.3$, $s = 1.1$, $C_v = 0.11$, $n = 20$

$$S.E.(\bar{x}) = s/\sqrt{n} = 1.1/\sqrt{20} = 0.245$$

$$S.E.(s) = s/\sqrt{2n} = 1.1/\sqrt{40} = 0.0174$$

$$S.E.(C_v) = C_v\sqrt{1+2C^2}/\sqrt{2n} = 0.11\sqrt{1 + 2(.11)^2}/\sqrt{40} = 0.017$$

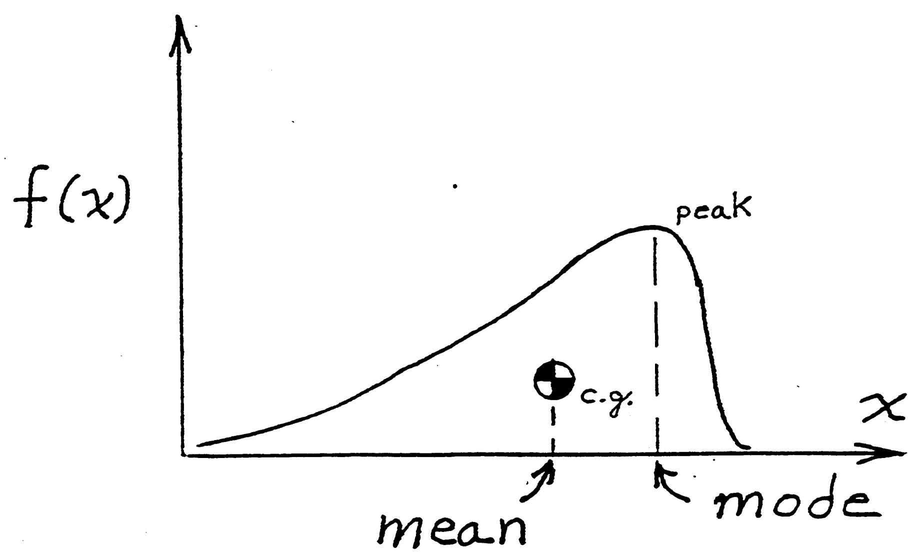
95 % C.L.: $z = \pm 1.96$

$$\bar{x} \pm 1.96\,(S.E._{\bar{x}}) = 10.3 \pm 0.48$$

$= \{10.78 \text{ to } 9.82\}$

3.10 Because the median divides the area in half, most of the area would be to the right of the median. The distribution is probably skewed right.

3.11 Sketch:



Sketch of p.d.f. for Prob. 3.11