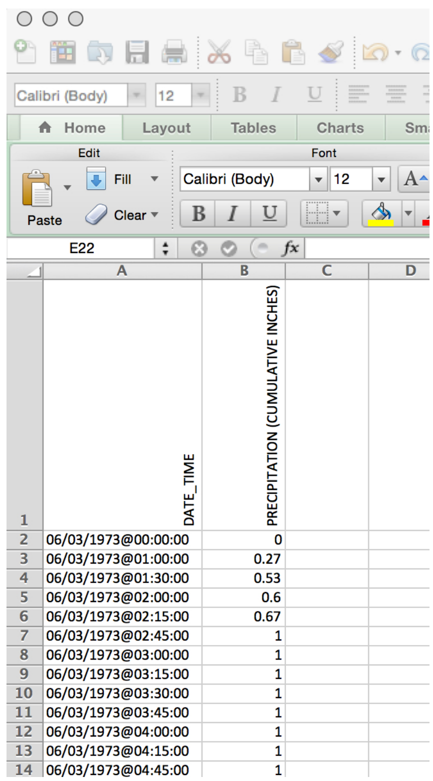
CE 3354 Engineering Hydrology
Exercise Set 3

Exercises

1. Figure 1 is a portion of the spreadsheet named `RainfallData.xlsx` that contains cumulative rainfall for a gage in Dallas, Texas. Convert/interpolate the data into 15-minute cumulative rainfall (amount of rainfall every 15 minutes). Be aware the cumulative data is irregular in time (there are variable Δt values in the data).

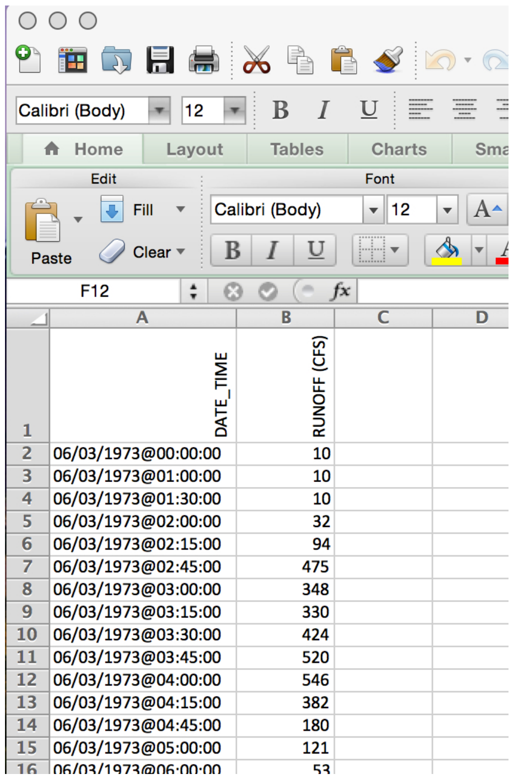


	A	B	C	D
1	DATE_TIME	PRECIPITATION (CUMULATIVE INCHES)		
2	06/03/1973@00:00:00	0		
3	06/03/1973@01:00:00	0.27		
4	06/03/1973@01:30:00	0.53		
5	06/03/1973@02:00:00	0.6		
6	06/03/1973@02:15:00	0.67		
7	06/03/1973@02:45:00	1		
8	06/03/1973@03:00:00	1		
9	06/03/1973@03:15:00	1		
10	06/03/1973@03:30:00	1		
11	06/03/1973@03:45:00	1		
12	06/03/1973@04:00:00	1		
13	06/03/1973@04:15:00	1		
14	06/03/1973@04:45:00	1		

Figure 1: Portion of Rainfall Data spreadsheet.

2. Convert the 15-minute cumulative rainfall into 15-minute incremental rainfall.

3. Figure 2 is a portion of the spreadsheet named `RunoffData.xlsx` that contains runoff for a gage in Dallas, Texas as specific moments in time. Convert/interpolate the data into 15-minute cumulative runoff. The drainage area is 6.92 miles. Express the result in watershed inches of runoff. Be aware the data is irregular in time (there are variable Δt values in the data).



	A	B
1	DATE_TIME	RUNOFF (CFS)
2	06/03/1973@00:00:00	10
3	06/03/1973@01:00:00	10
4	06/03/1973@01:30:00	10
5	06/03/1973@02:00:00	32
6	06/03/1973@02:15:00	94
7	06/03/1973@02:45:00	475
8	06/03/1973@03:00:00	348
9	06/03/1973@03:15:00	330
10	06/03/1973@03:30:00	424
11	06/03/1973@03:45:00	520
12	06/03/1973@04:00:00	546
13	06/03/1973@04:15:00	382
14	06/03/1973@04:45:00	180
15	06/03/1973@05:00:00	121
16	06/03/1973@06:00:00	53

Figure 2: Portion of Runoff Data spreadsheet.

4. Plot the 15-minute cumulative rainfall and the 15-minute cumulative runoff (in watershed inches) on the same time axis. What do these plots look like?

5. Figure 3 The following data represent gage height and annual peak discharge for some gaging station in Oklahoma. The stage is in feet and the discharge is in cubic feet per second. The data are sequential from 1923 through 1971.

Stage	Discharge	Stage	Discharge
23.0	200,000	18.50	114,000
11.8	42,000	14.93	70,200
6.4	11,300	15.30	70,700
10.4	32,400	17.60	92,800
18.7	108,000	21.45	135,000
15.0	73,000	10.48	25,800
15.3	76,500	8.80	17,500
12.1	47,800	9.07	18,700
9.5	28,200	12.71	36,300
10.6	33,700	14.64	49,200
9.3	25,700	21.41	120,000
6.4	11,700	14.86	56,800
16.0	77,800	14.65	54,800
9.9	26,600	21.62	158,000
13.0	47,500	21.22	165,000
16.44	75,600	17.83	103,000
8.48	19,200	8.76	19,700
10.26	27,800	9.00	21,100
13.59	51,000	22.60	171,000
18.54	94,000	6.74	10,400
18.12	97,200	12.54	42,000
22.82	179,000	14.10	52,800
19.55	124,000	16.42	77,000
19.48	110,000	18.33	101,000
		8.14	17,100

Figure 3: Data from Oklahoma Gaging Station

Use the data to:

(a) Plot year versus stage (x-axis is year).

(b) Plot year versus discharge (x-axis is year).

(c) Plot the discharge versus stage.

(d) Using the Weibull plotting position formula, determine the distribution parameters that fit the data for a log-normal distribution.

(e) Using the Weibull plotting position formula, determine the distribution parameters that fit the data for a Gumbell distribution.

(f) Using the Weibull plotting position formula, determine the distribution parameters that fit the data for a Gamma distribution.

(g) Estimate the discharge associated with a 25-percent chance exceedence probability (i.e. the value that is equal to or exceeded with a 1 in 4 chance).

(h) A resident claims that in the early 1900?s a flood corresponding to a stage of 30 feet occurred at the gage location. Estimate the exceedence probability (return period) of the flow assicoated with this event.

Save these data, you will reuse them in Flood Frequency Analysis Bulletin 17C software later on.