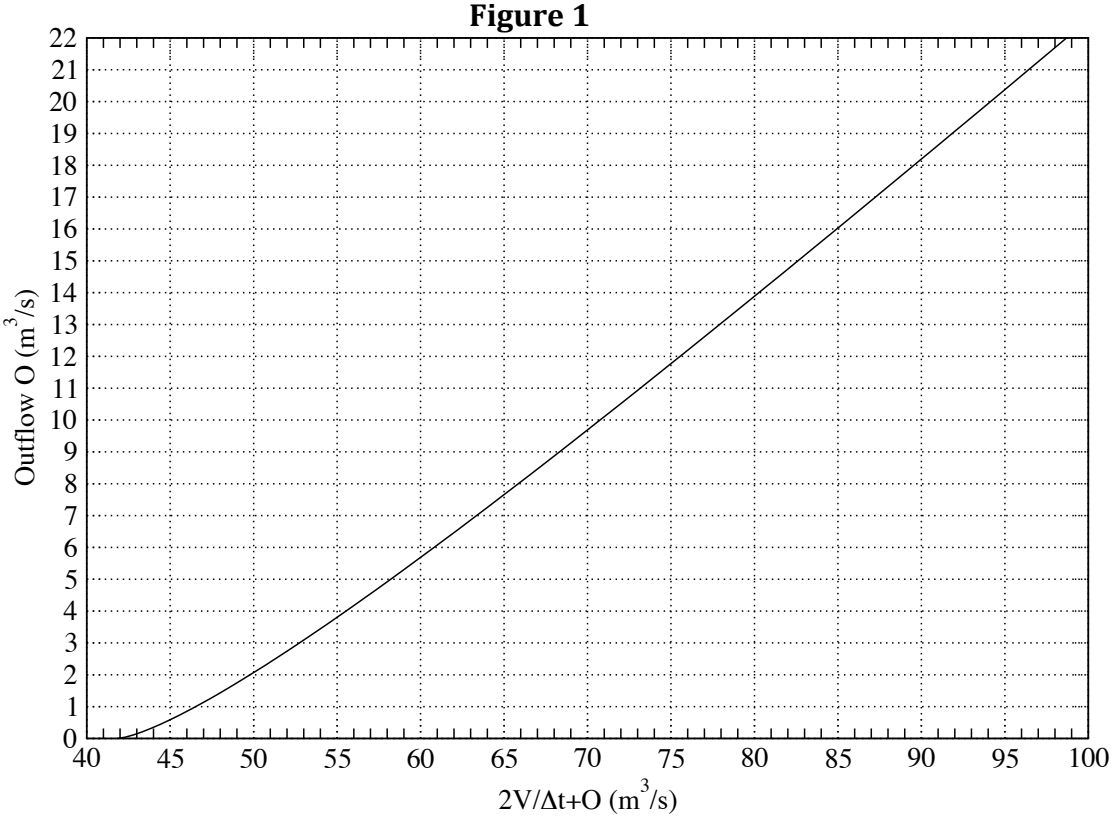
Surface Water Hydrology
Homework #4
Due on Monday, April 15, 2013

Problem 1. A reservoir has the same geometry as the reservoir example given in the textbook. The outflow O versus (2V/Δt +O) for the reservoir is shown in Figure 1.

Figure 1



Assume the initial conditions (i.e., O_1=0) and other reservoir parameters remain the same as the reservoir example given in the textbook.
(a) Complete the reservoir routing (i.e., Table 1) using the inflow hydrograph given in Table 1.
(b) Plot inflow and outflow hydrographs (i.e., I versus time, and O versus time).

Table 1.

Step n	Time t_n (days)	I_n	I_n+I_{n+1}	$(2V_n/\Delta t)-O_n$	$(2V_{n+1}/\Delta t)+O_{n+1}$	O_{n+1}	t_{n+1}
1	0.00	0.5	4.3	41.7			0.25
2	0.25	3.8	20.2				0.50
3	0.50	16.4	37.4				0.75
4	0.75	21.0	35.2				1.00
5	1.00	14.2	23.7				1.25
6	1.25	9.5	15.0				1.50
7	1.50	5.5	6.5				1.75
8	1.75	1.0	1.5				2.00

Problem 2. Table 2 lists an annual maximum discharge (Q) series of the little creek.

Table 2.

Year	Maximum Q (cfs)	Rank r	Return Period $T = \frac{n+1}{r}$ (year)
1990	16.0		
1991	18.1		
1992	20.0		
1993	22.0		
1994	9.6		
1995	17.0		
1996	20.4		
1997	12.2		
1998	15.3		
1999	13.0		
2000	23.2		
2001	11.0		
2002	24.5		
2003	30.2		
2004	19.2		
2005	8.4		
2006	10.0		
2007	6.3		
2008	14.4		
2009	20.5		

(a) Rank the annual maximum discharge (from high discharge to low discharge) and fill in the blanks in Table 2.
(b) Compute the return period associated with each year maximum discharge and fill in the blanks in Table 2.
(c) Use the calculated return periods to make a flood-frequency curve, i.e., maximum discharge Q versus the return period T, (x-axis is maximum discharge Q, and y-axis is return period T).
(d) Based on your flood-frequency curve, what is the return period of a flood event with a flow value of 25.0 cfs?
(e) Based on your flood-frequency curve, estimate the magnitude of the 15-year flood.