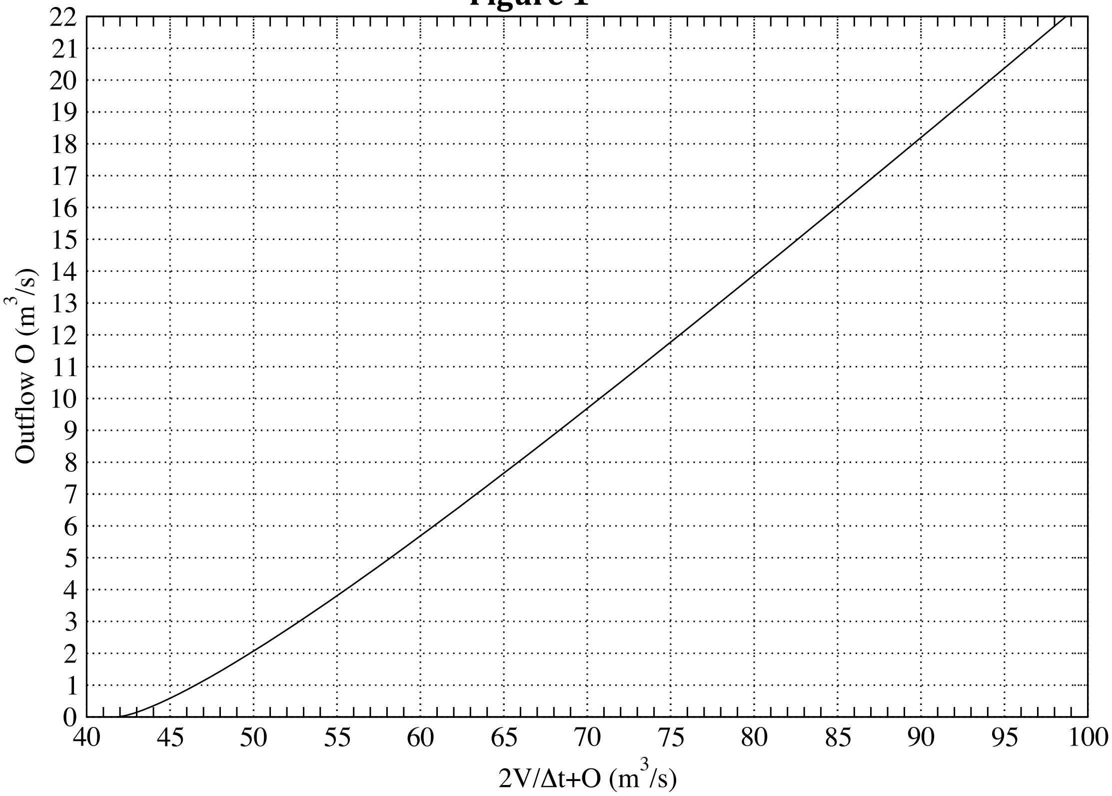
**Surface Water Hydrology**
**Homework #5**
**Due on Wednesday, April 11, 2012**

**Problem 1.** A reservoir has the same geometry as the reservoir example given in the textbook. The outflow O versus $(2V/\Delta t + O)$ 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.