

## CE 717 RIVER MECHANICS

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### Homework #1 – Numerical River Modeling - Chapter 11 due February 19, 2009

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#### **Problem #1 (25%)** *Numerical scheme*

Consider the floodwave propagation problem of Eq. 11.6 in the text. We learned in class that the FTBS scheme only has first order accuracy in space. In this assignment, you are asked to replace the first order backward scheme in space with a second order scheme. The second order forward scheme in space can be found in Table 11.3 as  $\bar{\delta}h/\bar{\delta}x = (1/2\Delta x)(-3h_j + 4h_{j+1} - h_{j+2})$ . You have to combine this second order scheme in space with the forward scheme in time, and let's rename it the FTF2S scheme. Determine whether this second order FTF2S scheme is better than the first order FTBS scheme analyzed in class. First define this FTF2S numerical scheme and define the boundary and initial conditions required to solve this problem.

#### **Problem #2 (25%)** *Consistency*

Examine the consistency of the FTF2S scheme you developed in #1 above.

#### **Problem #3 (25%)** *Stability*

Examine the stability of your scheme and define a stability diagram like Figure 11.2 in the book. Is the FTF2S convergent?

#### **Problem #4 (25%)**

Apply your FTF2S scheme to the example shown in Table E11.1.1 on p. 363. Show calculations with  $\Delta x = 2,000\text{m}$  for  $C_c = 0.5, 1$  and  $2$  and graphically compare the results at a time of  $2000\text{ s}$ . Would you recommend this scheme? What is the range of values for  $C_c$  that would be best for this scheme.

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