

## BIE 5300/6300 Assignment #9 Open-Channel Transition Design

23 Nov 04 (due 2 Dec 04)

*Show your calculations in an organized and neat format. Indicate any assumptions or relevant comments.*

### Given:

- The design flow rate is  $20.0 \text{ m}^3/\text{s}$
- The upstream trapezoidal section side slopes of  $m = 1.25$
- The upstream trapezoidal section bed width is  $b = 3.40 \text{ m}$
- The downstream rectangular section has  $b = 2.75 \text{ m}$
- The bed slope of the upstream trapezoidal section is  $0.000220 \text{ m/m}$
- The bed slope of the downstream rectangular flume is  $0.00332 \text{ m/m}$
- The upstream and downstream channels are concrete-lined
- The length of the transition will be  $L = 10.0 \text{ m}$
- Uniform flow will prevail upstream & downstream of the transition

### Required:

1. For uniform flow, do you expect subcritical flow both in the trapezoidal and rectangular sections?
2. Specify the rate of change of bed width with distance, using a 3<sup>rd</sup>-degree polynomial, through the transition.
3. Specify the rate of change of side slope with distance through the transition.
4. Determine the elevation of the bed (invert) of the transition versus distance along the transition so that the energy line has a constant slope through the transition, matching the upstream and downstream uniform flow depths.
5. Make sure the water surface through the transition has a constant, uniform slope.
6. What is the total bed elevation change across the transition?
7. Show your results graphically, with a side view and a plan view of the transition.