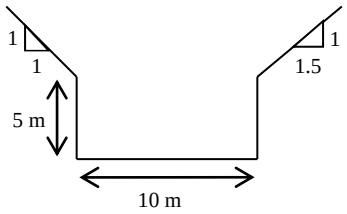
CE-205: Channel Hydraulics; Tutorial 3

1 A discharge of 500 cumec occurs in a natural channel whose section is approximated as follows.



Compute the Normal depth. Given: n = 0.02, S_0 = 0.001.

2 A discharge of 50 m^3/s occurs in an open channel. The bed slope is 0.001, and Manning's roughness coefficient is 0.02. The channel cross-sections are as follows: (a) Rectangular section with a bed width 10m, (b) trapezoidal channel, B=8m, *m* = 1.0

Perform the following tasks:

(i) Compute the normal depth and the corresponding sequent depth and energy loss, for each section.

(ii) Compute the normal depth in the rectangular section, considering it to be wide enough. Compare the results and comment.

(iii) Compute the bed-shear stress under uniform flow condition for each section.

(iv) Compute the Critical bed slope for each section, and hence determine the channel types.

3 An open channel is to be designed for a discharge of 50 m^3/s. The bed slope is 0.001, and Manning's roughness coefficient is 0.02. Determine the dimensions of most-efficient (a) rectangular channel, and (b) trapezoidal.

4. With reference to Q2, re-compute the normal depths with the Manning's roughness coefficient estimated as per Strickler's equation. Given d_{50} of bed material as 1 mm. Highlight the underlying assumption in the adopted procedure.