

## **CE 717 RIVER MECHANICS**

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### **Homework #1 – River Basins and Sediment Yield due February 9**

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#### **Problem #1 (20%)** *Upland runoff*

Solve problem 3.3 p. 77 and provide answers in SI units.

#### **Problem #2 (30%)** *Infiltration and vegetation*

If the storm defined in Problem 1 falls on a small plot 75m long at 7% slope, determine the maximum flow depth, velocity, discharge, Froude number and shear stress. The planar surface of Problem 1 is made of 20% sand 30% silt and 50% clay and covered with very dense Bermuda grass. Determine the soil type and porosity, calculate the infiltration rate and the cumulative infiltration after 3 hours. Estimate the friction coefficient from Eq. 3.9 and the Darcy-Weisbach coefficient. Finally estimate the time to equilibrium. (Note: it is fine to assume a constant infiltration rate over the time period for the hydraulic calculations.)

#### **Problem #3 (20%)** *Derivation*

*Solve Exercise 3.1 p. 77.*

#### **Problem #4 (30%)** *Sediment source and yield*

Consider the plot area and soil conditions studied in Problems 1 and 2 above. Assume that the plot is located in Nashville, Tennessee. Estimate the mean annual upland erosion losses in English tons/ acre-yr for the different land-use conditions: (1) freshly tilled slope; (2) bermuda grass; (3) cotton field with contour farming; (4) pasture; (5) dense forest; (6) reforested area with bushes covering 60% of the surface area; and (7) construction area with straw mulch. Compare and discuss the results.

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