CE 413 Homework I

Fall 2018 Due September 10 B.A. DeVantier

Problem 1

Class text problem 6.6 (Find the discharge from a full flowing cast iron pipe with a 24 in diameter and a slope of 0.004) in (ft,s) and (m,s) units **using Darcy-Weisbach, Manning, and Hazen-Williams** (calculate all unit forms, not just one unit type and converting) Note that the equivalent sand roughness height taken from the text is 0.00085 ft.

Problem 2

A rectangular channel carrying water with a Manning roughness coefficient of 0.015, a width of 4.2 ft (1.28 m) and a bottom slope of 0.048 ft per 100 ft (0.048 m per 100 m) maintains a steady flow of 20 ft^3/s. Determine the flow ~~rate~~ depth in ft and convert to m. Also, determine whether flow is super- or sub-critical.

Problem 3

Like Class text problem 7.4

A 15 in sanitary sewer pipe flowing full is expected to carry 5.0 cfs. The n value is 0.013. The minimum flow is expected to be $1/12^{th}$ of the maximum. Find the depth and velocity at minimum flow. Solve iteratively from a half-full pipe, showing each iterative step for θ.

Problem 4

Verify the results of class text Example 6.1, and compare it to results using an averaged Manning's n.

Problem 5

Determine critical depth for the channel of class text Example 6.1 and compare it to normal depth using the averaged n to describe the flow regime (super- or sub-critical).

Problem 6

Derive the constant 13.53 in the Manning flow equation for partially filled pipe flow using English units presented in class. Also, what would the constant be for metric units?