UNIVERSITY OF CALIFORNIA, DAVIS
DEPARTMENT OF CIVIL AND ENVIRONMENTAL ENGINEERING

COURSE: ENGINEERING HYDRAULICS (ECI 141)
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HOMEWORK 3. OPEN-CHANNEL FLOW: SPECIFIC ENERGY, CRITICAL FLOW, UNIFORM FLOW, AND HYDRAULIC JUMP

Assigned: Saturday, February 10, 2018
Due: Tuesday, February 20, 2018

PROBLEM 15

Solve Problem P10.18 from the book.

PROBLEM 16

Water flows over the bump in the bottom of the rectangular channel shown in Figure P10.62 of the book, with a *flowrate per unit width* of $q = 4$ m^2/s. The channel bottom contour is given by $z_B = 0.2\ exp(-x^2)$, where the distances are in meters. The water depth far upstream of the bump is $y_1 = 2$ m. Plot the graph of the water depth as a function of x, and the surface elevation as a function of x, for the range $-4 < x < 4$ m. Assume one-dimensional flow and negligible losses.

PROBLEM 17

Overnight a thin layer of ice forms on the surface of a 40-ft-wide river that is essentially of rectangular cross-sectional shape. Under these conditions, the flow depth is 3 ft. During the following day the sun melts the ice cover. Determine the new depth if the flowrate remains the same and the surface roughness of the ice is essentially the same as that for the bottom and sides of the river.

PROBLEM 18

When a channel of triangular cross section was new, a flowrate of Q caused the water to reach L = 2 m up the side of the channel. After considerable use, the walls of the channel became rougher and the Manning coefficient, n, doubled. Determine the new value of L if the flowrate stayed the same.

PROBLEM 19

You are informed that the discharge in a rectangular channel is 0.5 ft^3/s, the channel width is 0.25 ft and that the "super-critical" water depth before a hydraulic jump is 5 inches. Please check that the numbers correspond to a hydraulic jump and calculate the "sub-critical" water depth.