CE 313 Hydraulic Engineering
Winter 2013 Test Form 1

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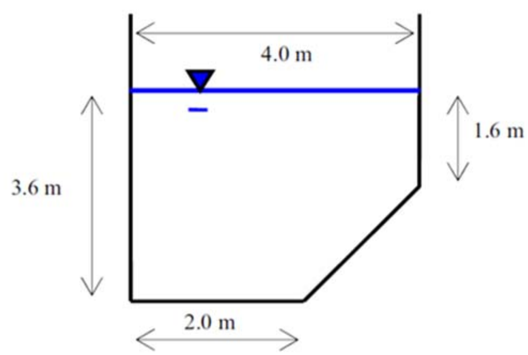
Quiz 9 **Name:** ______________________________

1. (15pts) Water flows at a depth of 3 ft in a trapezoidal concrete channel (n =0.013) with a bottom width of 3 ft, side slopes of z = 2, and a bottom slope of 0.001. Assuming uniform flow conditions, what is the discharge in the channel?
   a. 136 cfs
   b. 170 cfs
   c. 69 cfs
   d. 548 cfs

2. (15pts) A rectangular, channel with a slope of 0.0004 is cut through a rock outcropping (n = 0.035). If the width needs to be twice the depth, determine its dimensions for a discharge of 50 m^3/sec.
   a. y = 1.30 m, b = 2.60 m
   b. y = 12.10 m, b = 24.20 m
   c. y = 3.90 m, b = 7.80 m
   d. y = 4.90 m, b = 9.80 m

3. (15pts) A concrete channel (n = 0.013) with an unusual cross section (shown below) carries water at a flow rate of 30 m^3/sec. Determine the channel's bottom slope.



   a. S = 0.165
   b. S = 0.00075
   c. S = 0.0043
   d. S = 0.0258

4. (15pts) The following data are taken from measurements on Indian Fork Creek A=26m^2, P=16m, and S_o=0.02m/62m. Determine the average shear stress (τ_w) on the wetted perimeter of this channel.
   a. 0.00514N/m^2
   b. 5.14N/ m^2
   c. 5.14kg/ m^2
   d. 0.524kg/ m^2

5. (20pts)The great Kings River flume in Fresno County, California was used from 1890 to 1923 to carry logs from an elevation of 4500ft (where trees were cut) to an elevation of 300ft (at the railhead). The flume was 54miles long, constructed of wood (n=0.012), and had a V cross section as indicated below. It is claimed that logs would travel the length of the flume in 15 hours. Do you agree with this claim? Provide appropriate calculations to support your answer.

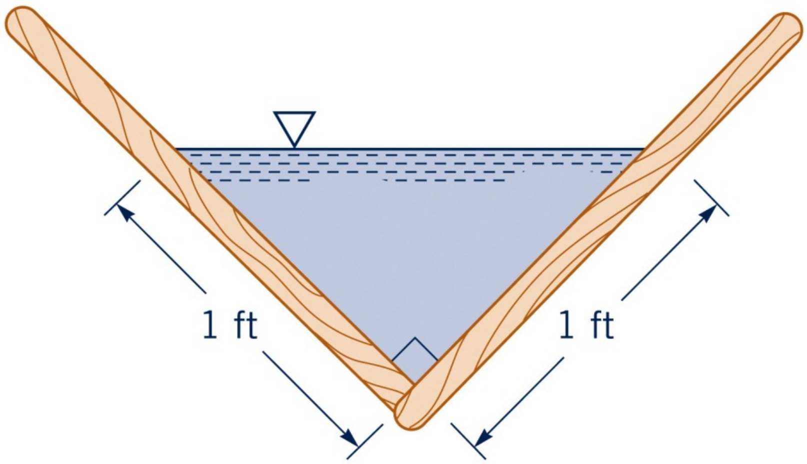


Figure P10.47
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6. (20pts) Water flows uniformly at a depth of 1m in a channel that is 5m wide as shown below. Further downstream, the channel cross section changes to another that has a width of “b”m and a height also of “b”m. Determine the value of “b” if the two portions of this channel are made of the same material and are constructed with the same bottom slope.

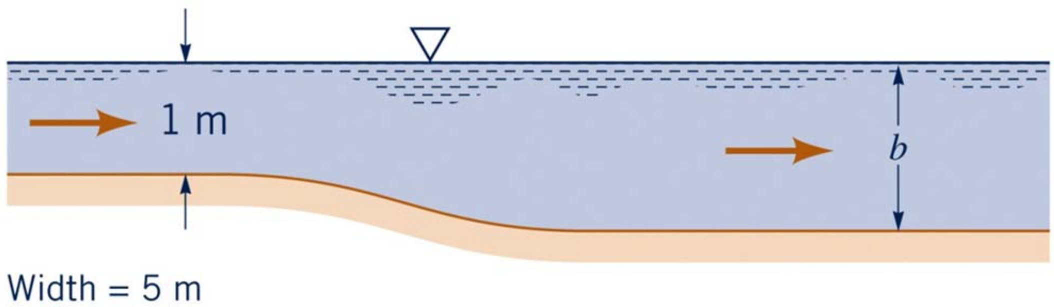

Figure P10.81
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$\rho_w = 1000\frac{kg}{m^3}$ and $v_w = 1.12 \times 10^{-6} m^2/s$

$$h_L = f\frac{l}{D}\frac{V^2}{2g}$$

$$h_L = K_L\frac{V^2}{2g}$$

$$Re = \frac{\rho V D}{\mu} = \frac{VD}{v}$$

$$Q = C_n Q_{ideal} = C_n A_n\sqrt{\frac{2(p_1 - p_2)}{\rho(1 - \beta^4)}}$$

$$Q = C_v Q_{ideal} = C_v A_T\sqrt{\frac{2(p_1 - p_2)}{\rho(1 - \beta^4)}}$$

$$\beta = \frac{d}{D}$$

$$Fr = \frac{v}{\sqrt{gy}}$$

$$C = \sqrt{gy}$$

$$E = y + \frac{V^2}{2g}$$

$$V = \frac{K}{n}R_h^{2/3}S_0^{1/2}$$

$$Q = \frac{K}{n}AR_h^{2/3}S_o^{\;1/2}$$

K = 1.49 (English)

K = 1.0 (SI)

$$\tau_w = \gamma R_h S_o$$

Newton-Raphson method

$$y^{n+1} = y^n - \frac{F^n}{[dF/dy]^n}$$