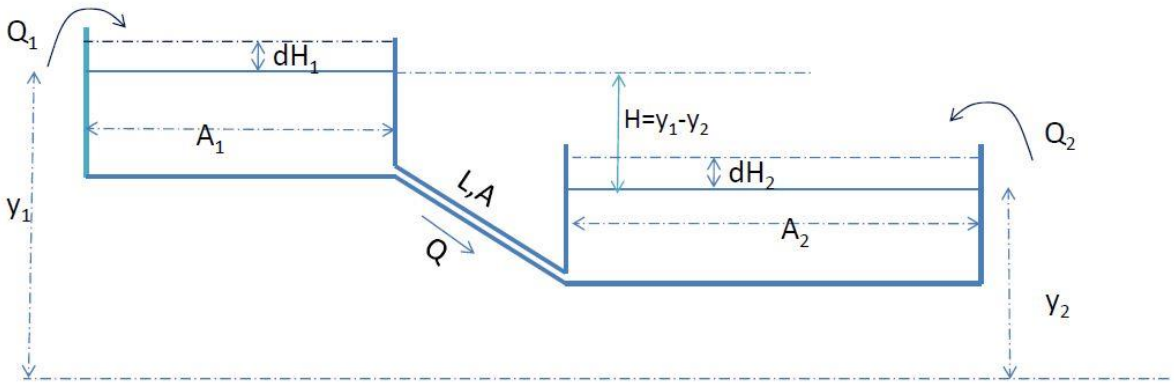
Tutorial 5

1. Example 1 from Lecture 7
   Two reservoirs are connected by a pipe where the reservoirs are relatively small and the water surface elevations of the reservoirs and therefore the discharge in the pipe vary over time. Calculate the change in reservoir water surface with time for the following setup.

Example 1 (Tutorial)



A_1=930 m^2 A_2=185 m^2
K_s=4.6x10^{-5} m
L=3050 m
D=0.3 m
Initial H=30 m
Q_1=Q_2=0 (no external inflow)
Ignore local losses because the pipe is long, only keep k_L=1 for the pipe inflow into reservoir 2.
Find the time needed for y_1 to drop by 3m.

2. A valve is placed at the downstream end of a 3 km long pipeline. Water is initially flowing along the pipe at a mean velocity of 2.5 m/s. What is the magnitude of the surge pressure generated by a sudden and complete valve closure? Also, sketch the variation in pressure at 1) the valve and 2) at the mid-point of the pipeline after the valve closure. Assume celerity of sound as c=1500 m/s.

3. A concrete trapezoidal channel has a bottom slope of $S_0 = 0.001$ (m/m) and a Manning roughness coefficient of n = 0.013. The bottom width of the channel is equal to b = 3.0 m and the side slopes are m = 3 (3H:1V). Determine the velocity and discharge when the flow is normal at a depth of 2.1 m.