CE 3305 Engineering Fluid Mechanics
Exercise Set 15
Summer 2018 – GERMANY

Purpose : Modified Bernoulli's Equation (Head Losses) in hydraulics systems
Assessment Criteria : Completion, plausible solutions, use **R** as a calculator.

Exercises

1. (Problem 7.34 pg 283) Figure 1 depicts a reservoir draining through a valve used to control the flow rate. The head loss across the valve is $h_l = \frac{4V^2}{2g}$, where V is the velocity in the pipe. The cross-sectional area of the pipe is 8 cm^2. All loss occurs in the valve. The elevation of the water level in the reservoir above the pipe outlet is 9 m. Find the discharge in the pipe; assume $\alpha = 1.0$ at all locations in the system.
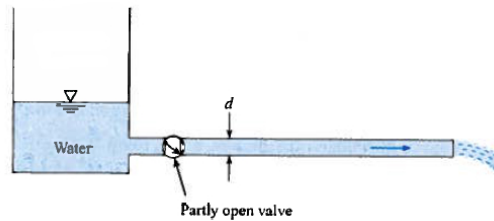

Figure 1: Reservoir draining through a valve and a pipe

2. (Problem 7.48 pg 285) Figure 2 is a schematic of a pump system that supplies water to a hydraulic component through a 15 cm diameter, 60 m length of pipe. The mean velocity in the pipe is 2 m/s, and the head loss in the pipe is 2 m. Determine the pressure drop in the horizontal pipe and the power required from the pump to overcome the head loss in the pipe.
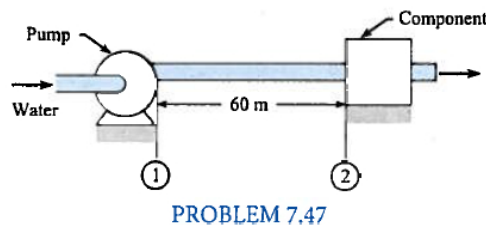

Figure 2: Pumping system