

Florida International University
CWR 3201 Fluid Mechanics, Fall 2018
Instructor: Arturo S. Leon, Ph.D., P.E., D.WRE
TA: Thao Do, CEE Undergraduate

Final Exam

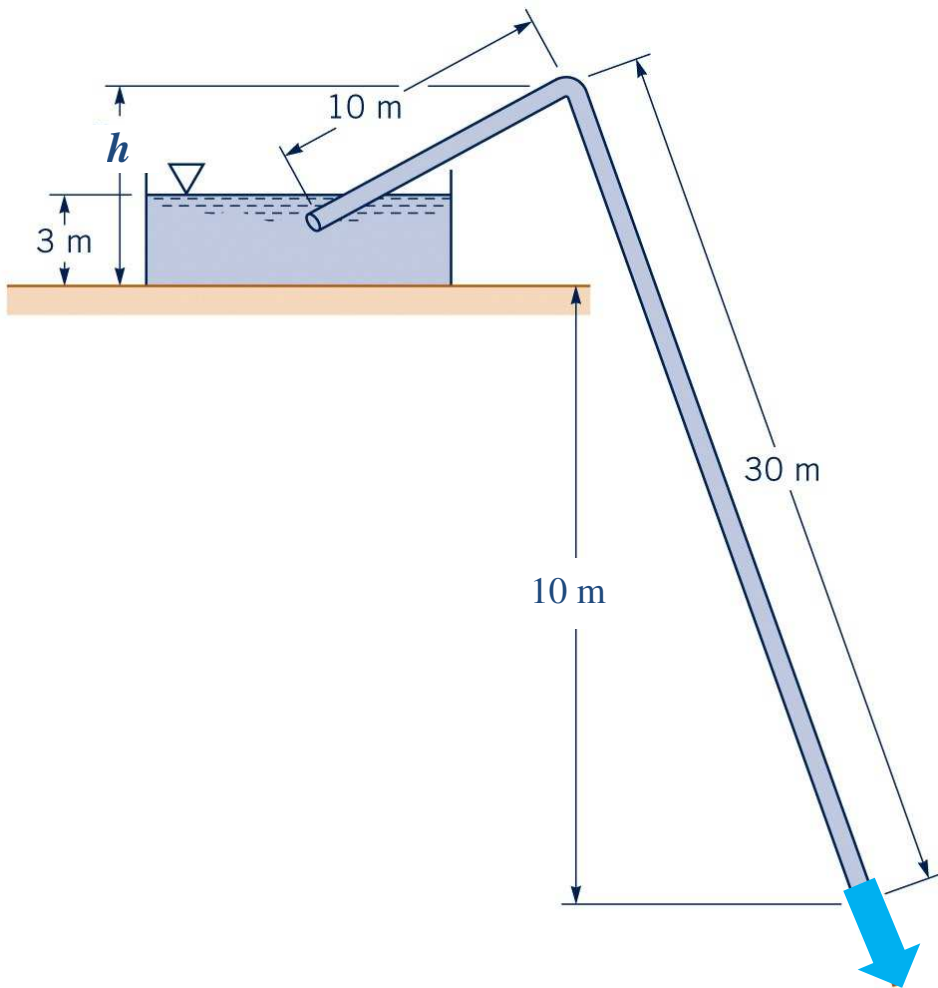
Student Name and ID: _____ **Date:** _____

- ✓ **You will have two hours to complete the exam. The exam is closed book and closed notes**
- ✓ **The procedure will be graded. Please justify your answers**

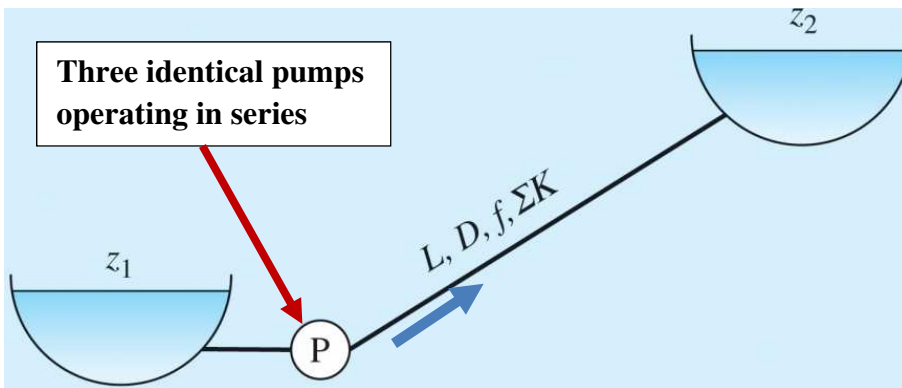
1. (15 points) A 10-ft wide rectangular channel is flowing at a depth of 10-ft with a velocity of 10 ft/s. If the channel has a smooth contraction in width from 10 ft to 8 ft, how much should the channel bottom drop to maintain a constant water surface elevation through the transition? (Head loss coefficient = 0)

2. (15 points) A hydraulic jump at the base of a spillway of a dam is such that the depths upstream and downstream of the jump are 0.90 and 3.6 m, respectively. If the spillway is 10 m wide, what is the flowrate over the spillway?

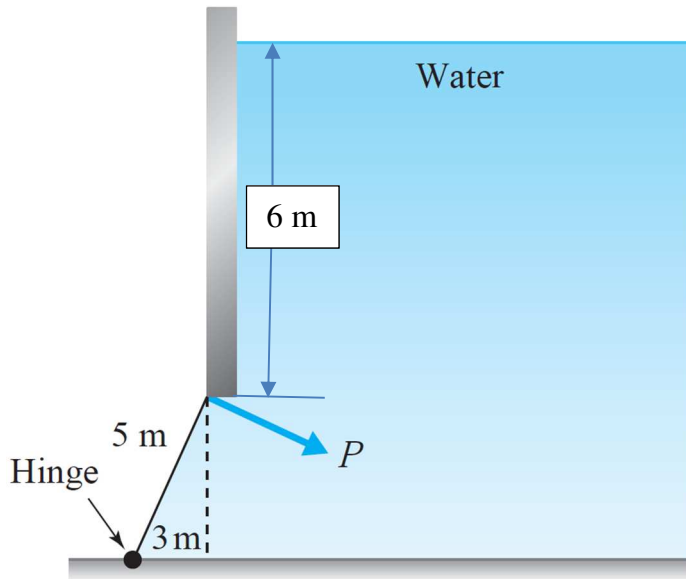
3. (20 points) A 40-m long, 12-mm diameter pipe with a friction factor of 0.020 is used to siphon 30°C water from a tank as shown below. Determine the maximum value of h allowed if there is to be no cavitation within the hose. Neglect minor losses. Use $P_{\text{vapor}}(30^\circ\text{C}) = 4.24 \text{ kPa}$, $P_{\text{atm}} = 101.3 \text{ kPa}$, $\gamma(30^\circ\text{C}) = 9.768 \text{ kN/m}^3$.



4. (20 points) Water is pumped between two reservoirs in a pipeline with the following characteristics: $D = 300$ mm, $L = 50$ m, $f = 0.025$, $\Sigma K = 4.0$. The radial-flow pump characteristic curve is approximated by the formula $H_P = 22.9 + 10.7Q - 111Q^2$ where H_P is in meters and Q is in m^3/s . Determine the discharge Q_D and pump head H_D if $z_2 - z_1 = 40$ m with **three identical pumps operating in series**.



5. (15 points) Calculate the force P necessary to hold the 4-m wide gate in the position shown in the Figure below.



6. (15 points) What is the force needed to hold the orifice plate shown below onto the pipe?

