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

1. (Problem 7.56 pg 286) Figure 1 is a schematic of a hydropower system. The elevation difference between the reservoir water surface and the pond water surface downstream of the reservoir (called the tailwater), H, is 24 m. The velocity of the water exiting into the pond is 7 m/s, and the discharge through the system is 4 m^3/s. Neglect frictional losses in the penstock (the pipe from the reservoir to the turbine). Estimate the power produced by the turbine in kilowatts.
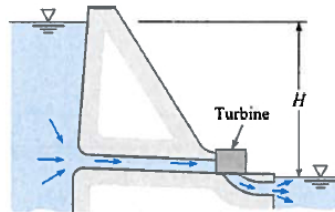
PROBLEM 7.56

Figure 1: Hydropower system

(Problem 7.56 pg 286) (Continued)

2. (Problem 7.87 pg 290) (SI converted from actual problem) Figure 2 is a schematic of a pumped-storage system. How much power must be supplied to the water by the pump (in kilowatts) to pump water at 0.085 m^3/s at 20 $^\circ C$ from the lower to the upper reservoir?

The head loss in the pipes is $h_l = 0.018\frac{L}{D}\frac{V^2}{2g}$, where L is the length of the pipe in meters, and D is the diameter of the pipe in meters. Sketch the HGL and EGL for the system.

Elevation = 42.7 m

Elevation = 27.4 m   L = 608 m
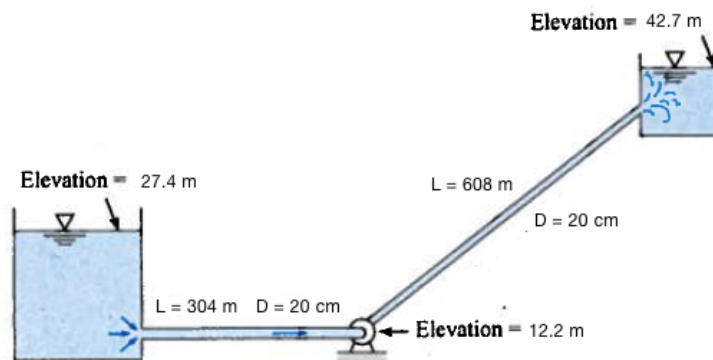
D = 20 cm

L = 304 m   D = 20 cm

Elevation = 12.2 m

Figure 2: Pump-storage system

(Problem 7.87 pg 290) (Continued)