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[1]. A spillway model is to be built to a scale of *1:25* across a flume that is *2 ft* wide. The prototype is *37.5 ft* high, and the maximum head expected is *5.0 ft*. If the flow over the model at *0.20 ft* head is *0.70 cfs*, what is the flow per unit width (in ft^2/s) in the prototype?

Solution: q = _____.

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[2]. The discharge per unit length $q = Q/B$ over a rectangular weir depends on the approach depth H and on the acceleration of gravity g. (Here, Q is the discharge and B is the width of the weir). First, using dimensional analysis, form a Π (Pi) term involving the parameters q, H, and g. Then, using the definition of the unit discharge, namely, $q = Q/B$, and making the Π term equal to a constant C,obtain an expression for the discharge Q.

Solution: $Q =$ _____

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[3]. Water at 50^oC flows from point *A* to point *B* through 200 *m* of *350-mm* diameter cast iron pipe ($e = 0.00061\ m$). Point B is 6.3 *m* above *A,* and the pressure at *B* must be maintained at *125 kPa*. If the discharge through the pipe is $0.25\ m^3/s$, what must be the pressure at *A* in *kPa*? *NOTE*: You can use the Moody diagram, Haaland's equation, or Swamee-Jain's equation to calculate the friction factor. Specify which method you selected for your solution.

Solution: p_A = _____

***f* obtained using**: [ ] Moody diagram [ ] Haaland's equation [ ] Swamee-Jain's equation

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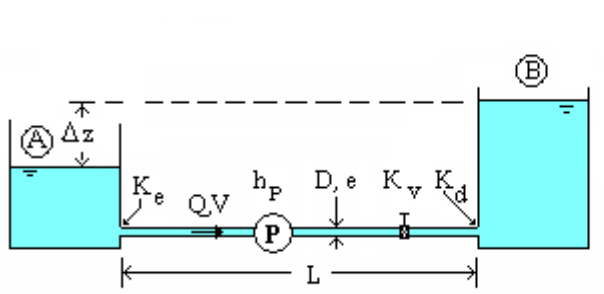
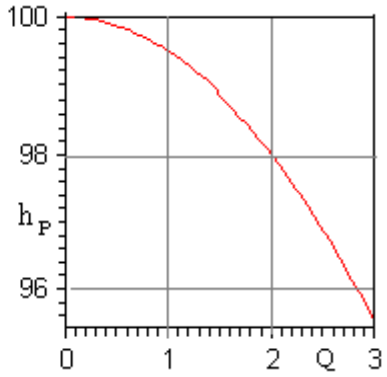
[4]. For the pump-pipeline-reservoir system shown in the figure the following data are provided: $Q = 2.0\ cfs$, $L = 1250\ ft$, $D = 0.50\ ft$, $e = 0.0001\ in$, $K_e = 0.8$, $K_v = 1.8$, and $K_d = 1.0$. The graph below shows the pump curve with $h_P(ft)$ and $Q(cfs)$. Using Swamee-Jain's equation to calculate the friction factor, determine the value of the difference of elevation between the reservoirs' free surfaces, Δz. The flowing fluid is water at $60\ ^oF$.





Solution: Δz = _____