

CIVL 4046 Fluid Mechanics

Assignment Number 1

Date: February 13, 2013

Deadline for submission is one week from the date assignment is given

Solve the following problems:

1. Find dimensionally non-homogeneous equations from the engineering literature in your specialization (Architectural, Civil, Mechanical or Mechatronics Engineering). List at least three equations from your specialization and prove that they are dimensionally non-homogeneous. **(60%)**

2. (1.10) The pressure rise Δp associated with wind hitting a window of a building can be estimated using the formula $\Delta p = \rho(V^2/2)$, where ρ is density of air and V is the speed of the wind. Apply the grid method to calculate pressure rise for $\rho = 1.2 \text{ kg/m}^3$ and $V = 100 \text{ km/h}$. **(20%)**
 - a. Express your answer in pascals.
 - b. Express your answer in meters of water column (m-H₂O).

3. (1.13) Apply the grid method to calculate the cost in U.S. dollars to operate a pump for one year. The pump power is 20 hp. The pump operates for 20 hr/day, and electricity costs \$0.10 per kWh. **(20%)**