

Name: Class: TLU ID #:

Chapter 7

Dimensional Analysis

Homework Assignment #7

Due in Class on Monday, April 29, 2024

Students work through the following problems from your textbook: **7.8; 7.14; 7.16; 7.24.**

Please also solve the following problems:

1. The input power, P , of a centrifugal pump is a function of the flowrate, Q , impeller diameter, D , angular velocity, ω , the density ρ and viscosity μ of the fluid.

$$P = f(Q, D, \omega, \rho, \mu)$$

Use the repeating variable method to find a dimensionless relationship between the parameters. (use ω , ρ and D as repeating variables).

2. The pressure drop, Δp , along a straight pipe of diameter D has been experimentally studied, and it is observed that for laminar flow of a given fluid and pipe, the pressure drop varies directly with the distance, l , between pressure taps. Assume that Δp is a function of D and l , the velocity, V , and the fluid viscosity μ . Use dimensional analysis to determine a suitable set of dimensionless parameters.