**MARMARA UNIVERSITY**

**FACULTY OF ENGINEERING**

**DEPARTMENT OF MECHANICAL ENGINEERING**

**ME4111/ME4011/ME411 EXPERIMENTAL METHODS IN MECHANICAL ENGINEERING**

**EXPERIMENT NO. 7**

**DESIGN OF AN EXPERIMENT FOR DETERMINING THE FLOW CHARACTERISTICS IN A PIPING SYSTEM**

1. **Objective**

This experiment aims at studying the flow characteristics in a piping system. The working fluid is tap water.

1. **Introduction**

The working fluid is fed by a centrifugal pump into a system consisting of identical plastic pipes that have the same inner diameter *Di*. The volumetric flow rate is to be measured using a flowmeter.

1. **Theoretical background**

The Reynolds number (Re) is the ratio of the inertial forces to the viscous forces and can be expressed for a flow in a circular pipe as follows:

 (1)

where *ρ* is the density of the fluid,  the mean velocity of the fluid, *Di* the inner diameter of the pipe, and *µ* is the dynamic viscosity of the fluid.

1. **Experimental procedure**

* Measure and record the pipe inner diameter *Di*.
* Record the fluid temperature.
* Record the pump input voltage and current.
* Record the volumetric flow rate.
* Repeat second, third and fourth steps with different input voltages.

1. **Required calculations and graphing**

First, for each measurement repetition, calculate

* the corresponding power supplied to the pump,
* the corresponding Reynolds number for the flow.

Then, plot

* the power supplied to the pump versus the volumetric flow rate,
* the power supplied to the pump versus the Reynolds number for the flow.

Discuss whether the flow is laminar or turbulent for the considered range of volumetric flow rates. Also comment on your results.

1. **Required report format**

* The report should be organized as follows: Title Page, Introduction, Experimental Setup and Procedure, Theoretical Background and Calculation Details, Results and Discussion, Conclusions, References and Appendices (if any).
* Measured and calculated quantities should be presented in tabular form.
* Show all details of your calculations.
* Discuss the possible sources of errors.
* Make recommendations for improving the experimental procedure.