**57:020 Mechanics of Fluids and Transport Processes**

Measurement of flow rate, velocity profile and friction factor in pipe flows

Submitted to: Professor Frederick Stern

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Group: \_\_\_\_\_\_\_\_\_\_\_\_\_\_

Lab Date: Month/Date/Year

Submission Date: Month/Date/Year

1. **EFD PreLab 2 Questions (submitted before Lab2, 10 points)**
2. **Test and Simulation Design (10 points)**

Using your own words describe the purpose of the Lab experiment.

**III. EFD Process (15 points)**

Use EFD process diagram for Lab 2 given in the exercise notes and describe in your own

words how you implemented the EFD process. Describe all the steps that are applicable.

**IV. Data Analysis and Discussion (55 points)**

* 1. Attach the completed excel data reduction sheet showing all the calculations along with the lab report. (**10 points**)
  2. Plot your experimental velocity profile and the Schilichting data on the same graph. Show the uncertainty band, near the wall where precision limits were obtained by repeating the measurement 10 times. Note that the precision limit was taken at a radial position of 24 mm from the center of the pipe. Refer to Question 2 in section 3.1.5 of exercise notes. (**8 points**)
  3. Plot pressure drop as function of distance along pipe length. Use “ft of water” as units for pressure and “ft” for unit of length along pipe. Refer to Question 3 in section 3.1.5 of exercise notes. (**7 points**)
  4. Calculate the experimental friction factor using tap numbers 3 and 4 and compare results with Moody diagram. For using the Moody diagram you will need the pipe Reynolds number and roughness factor (k/D). The Reynolds number can be calculated using the data reduction sheet. The k (roughness) and D (diameter) values for both pipes are given in table A1 and A2 in Appendix A of exercise notes. Include the Moody diagram showing the experimental results and uncertainty band along with the lab report. This can be done by hand. Refer to Question 4 in section 3.1.5 of exercise notes. (**7 points**)
  5. Discuss the advantages of using non-dimensional forms for variables r/R, u/Umax, f, Re etc. Refer to Question 5 in section 3.1.5 of exercise notes. (**8 points**)
  6. Discuss the flow rate found using the ePIV machine. Refer to Questions 1 and 2 in section 3.2.4. (**15 points)**

**V. Conclusions (10 points)**

A. Conclusions regarding achieving purpose of experiment (**4 points**)

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B. What you have learned from EFD Lab. (**2 points**)

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C. Comments on the hands-on experience, the software interface, and overall lab performance (**2 points**)

D. Describe the cooperation between group members (**1 point**)

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E. Suggestions and improvements (**1 point**)

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