

# Experiment No. 6

## EFFICIENCY OF A SQUARE DIFFUSER

### Instructions:

For submission of this experiment, you have to submit **one excel file** and **one PDF** file. Use the naming format: *rollno\_exp6.pdf or.xlsx* ( *Ex.183109002\_exp6.pdf or.xlsx* ). The detailed instructions are given below.

### Excel sheet:

- Fill the columns in the excel sheet provided to you. There are two sets of readings, one for **Part 1** and another for **Part 2**.
- In the excel sheet you have to plot the graph of  $\eta_p$  vs  $Re$  for **Part 1**
- **The calculations are explained in the video follow that and do not refer the manual for calculations.**

### PDF:

- In the PDF you have to scan and **submit hand written document** containing one calculation for **Part 1** and one for **Part 2**. Please see **note1** and **note2** for details of calculations. This representative calculation is a means to check if the calculations done by you in the excel sheet is correct and without errors. Make sure that the calculations that you write down are step by step **detailed** calculations using all the formulas provided to you.
- Attach also the screenshot of graphs and calculated table in the pdf which you have drawn in the excel sheet. (copy pasting will be okay)
- After the calculations and graph will come the handwritten sources of error (at least two).
- Next will come the handwritten answers to the following questions:
  - 1) What are the reasons for flow separation?
  - 2) Why pressure recovery efficiency increases with Reynold's number?
  - 3) What are the losses involved during flow through diffuser?
  - 4) Give applications other than that explained in the video where a diffuser is used and why.
  - 5) What are the factors that govern the performance of the diffuser?
  - 6) Why the upper and lower edge pressure distribution is different (in **Part 2**) ?
  - 7) If you could change the current experimental setup, what is the one change you would make to improve the results and why?
- Finally add conclusions that you draw from this experiment both for **Part 1** and **Part 2**. (Give a careful thought after going through the theory and then write the conclusions)

## **Note1 for Calculation:**

### **For Part 1:**

The pressure  $P_1$  is less than  $P_2$  as can be seen in the deflection. Hence  $h_w$  is negative. Therefore, the calculated  $P_1$  will be negative and  $P_2 - P_1$  is positive.

Eg:

If  $h_w = -10$  mm,  $P_1 = 1000 \times 9.81 \times (-10/1000) = -98.1$  Pa

$P_2 = 0$  Pa

$\therefore P_2 - P_1 = 98.1$  Pa

### **For Part 2:**

Here we are directly connecting the two pressure tapping to the two limbs of the manometer. Hence, we can directly calculate the pressure difference.

Eg:

If  $h_w = 10$  mm,

$\Delta P = 1000 \times 9.81 \times (10/1000) = 98.1$  Pa

## **Note2**

To determine the serial number of the calculations that you need to show detailed calculations for,

**For Part 1: Please obtain the remainder of the last digit of your enrolment number on division by 5.**

For Ex. If your roll number is 183109016, you obtain the remainder obtained by division of 6 by 5, i.e. 1.

**For Part 2: Please obtain the remainder of the last digit of your enrolment number on division by 10.**

For Ex. If your roll number is 183109013, you obtain the remainder obtained by division of 3 by 10, i.e. 3.

Thank You.