

```
[1] import numpy as np
```

Seminar 5

Flow Measurements

1. Hydrodynamics II

Problem 1 - Venturi Meter

Water flows along a horizontal pipeline of 100 mm diameter at an unknown rate. A Venturi meter installed in the pipeline indicates a piezometric head (pressure head) of 950 mm at the entrance and 200mm at the throat. The throat diameter is 60 mm. If the $C_D = 0.97$, what is the discharge through the pipeline?

Solution of Problem 1

The relevant equations can be found in slides L5 - slides 6-7

The main equation is:

$$Q_A = C_D A_1 \sqrt{\frac{2gH}{[(A_1/A_2)^2 - 1]}}$$

with $H = P_1 - P_2$ and $A = \pi D^2/4$

```
[16] #Solution problem 1
# Given are:
D1 = 100 # mm, diameter of pipe
D2 = 60 # mm, thraot diameter
P1 = 950 # mm, pressure head at inlet
P2 = 200 # mm, pressure head at throat
CD1 = 0.97# [], coeff. of discharge.
g1 = 9.81 # m/s^2, gravity

# Interim calculation
A1 = np.pi*D1**2/4*(1/1E6) # m^2, area at inlet, unit converted
A2 = np.pi*D2**2/4*(1/1E6) # m^2, area at throat, unit converted
H = (P1-P2)*1/1000 # m, difference in pressure head between inlet
and throat.
```

```
# calculation (see equation above for Q_A)
QA = CD1*A1*np.sqrt(2*g1*H/((A1/A2)**2 -1 ))

#output
print("The resulting discharge is: {0:1.4f}".format(QA),
      "m\u00b3/s")
```

The resulting discharge is: 0.0113 m³/s

Assignment problems - Next week

[]