Bernoulli’s Equation for Final 1

Water flows through a smooth, horizontal Venturi meter with an entrance diameter of 365 mm and a throat diameter of 115 mm. If the pressure difference between these sections corresponds to a head of 467 mm of water, determine the mass flow rate in kg/s.

## **Given Data**

* **Entrance diameter**,
* **Throat diameter**,
* **Pressure head difference**,
* **Density of water**,
* **Gravitational acceleration**,

## **Step 1: Cross-Sectional Areas**

The cross-sectional areas at the entrance and throat are given by:

1. For the entrance area :
2. For the throat area :

## **Step 2: Continuity Equation**

From the continuity equation, the relationship between velocities and is:

Substitute the values of ( A\_1 ) and ( A\_2 ):

## **Step 3: Bernoulli’s Equation**

Bernoulli’s equation relates the head difference to the velocities and :

Substitute into the equation:

Simplify:

Rearranging for :

Substitute and :

## **Step 4: Mass Flow Rate**

The mass flow rate is given by:

Substitute , , and :

## **Final Answer**

The mass flow rate is: