

October 1, 2014

NAME

Fluids-ID

Quiz 4. A piezometer and a Pitot tube are tapped into a horizontal water pipe to measure static and stagnation pressures. For the indicated water column heights in the figure, determine the velocity at the center of the pipe.

- Bernoulli equation:

$$\frac{p_1}{\rho g} + \frac{V_1^2}{2g} + z_1 = \frac{p_2}{\rho g} + \frac{V_2^2}{2g} + z_2$$

Note: Attendance (+2 points), Format (+1 Points)

Solution:

1) Monometer

$$\begin{aligned} p_1 &= \rho g(h_1 + h_2) \\ p_2 &= \rho g(h_1 + h_2 + h_3) \end{aligned} \quad (+2 \text{ points})$$

2) Bernoulli equation

Since $V_2 = 0$ and $z_1 = z_2$

$$\frac{V_1^2}{2g} = \frac{p_2 - p_1}{\rho g} \quad (+4 \text{ points})$$

Substituting the p_1 and p_2 expressions into the Bernoulli equation and solving for V_1 gives

$$V_1 = \sqrt{2gh_3} = \sqrt{2(9.81 \text{ m/s}^2)(0.12 \text{ m})} = 1.53 \text{ m/s} \quad (+1 \text{ points})$$

