07/19/2021

Solution :

Name:_____

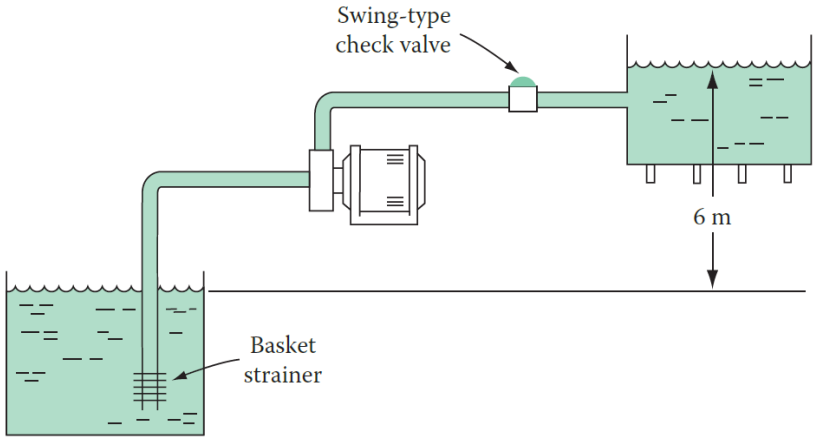
Quiz 6

MECH3011 Fluid Mechanics

Summer 2021

- **Closed book/closed notes**
- **Show all steps to obtain full credit**
- **Calculator allowed**

Water is pumped through D = 10 cm galvanized pipe from tank on the left to right. The pump inlet line is 20 m long; the pump outlet line is 10 m long. All fittings are regular radius flanged. Assume the gate valve is fully open and the loss factor for the basket strainer is 1.3, for a flow rate through the system of 0.02 m^3/s. What is the pressure drop due to major loss? ρ_{water} = 1000 kg/m^3



$\forall = 0.02 \frac{m^3}{s}$ $A = \frac{\pi D^2}{4} = 0.0079\ m^2$ $V_{pipe} = \frac{\dot{\forall}}{A} = 2.53 \frac{m}{s}$

major loss = $\sum \frac{1}{2} \rho V_{pipe}^2 \cdot \frac{L}{D} \cdot f$

$\rho = 1000\ kg/m^3$ $\frac{L}{D} = \frac{20+10}{0.1} = 300$ $\frac{1}{2}\rho V^2 = 3200 \frac{kg}{m\,s^2}$

$Re = \frac{\rho V D}{\mu} = \frac{1000(2.53)0.1}{8.9\times10^{-4}} \sim 28{,}000$ $\frac{e}{D} = \frac{0.015\ cm}{10\ cm} = 0.0015$

$f = 0.023$ from Table.

$\Rightarrow$ major loss = $3200 \frac{kg}{m\,s^2} \cdot 300 \cdot 0.023 = 22.1\ kPa$.