CE 3305 Fluid Mechanics
Spring 2014 Quiz 10

1. The discharge of water in a 35-cm-diameter pipe is 0.06 m^3/s. What is the mean section velocity?

$Q = \bar{V}A$

$\bar{V} = \frac{Q}{A} = \frac{0.06 m^3/s}{\frac{\pi (0.35m)^2}{4}} = 0.62 m/s$

2. A pipe with a 2 m diameter carries water at a velocity of 4 m/s. What is the discharge in m^3/s and ft^3/s? What is the mass flow rate in kg/s and lb-f/sec?

$Q = \bar{V}A$

$= (4 m/s)\frac{\pi (2m)^2}{4} = 12.56 m^3/s \leftarrow Q_{m^3/s}$

$Q = 12.56 m^3/s \cdot \left(\frac{3.28 ft}{1 m}\right)^3 = 443.4 ft^3/s \leftarrow Q_{CFS}$

$\dot{m} = \rho Q$ Assume H_2O at STP

$\dot{m} = \left(\frac{1000 kg}{m^3}\right)(12.56 m^3/s) = 12,560 kg/s$

$\dot{m} = \left(\frac{62.4 lbf}{ft^3}\right)(443.4 ft^3/s) = 27,668 lbf/s$