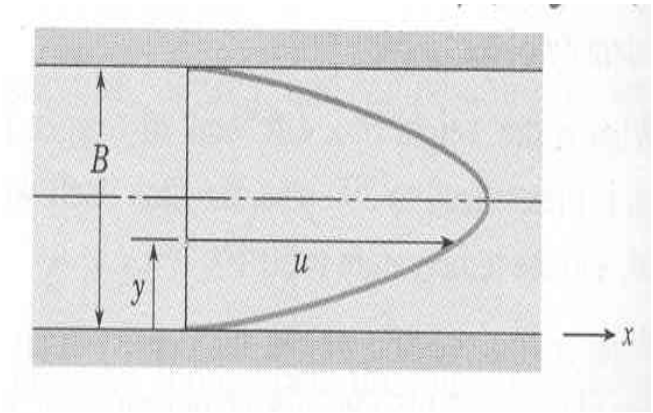
057:20 **TEST # 1** **October 2**

1. For water flow in channel as shown in figure

B = 0.1m U_o = 1.0 m/s

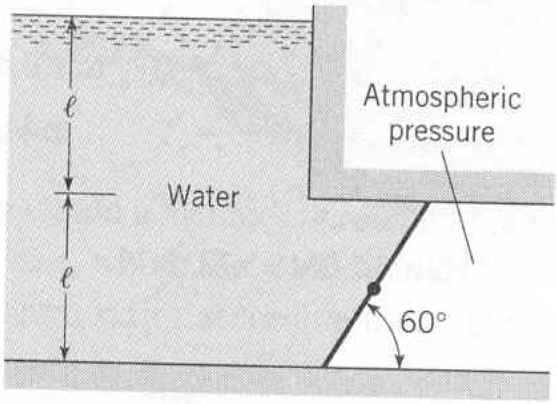
$$u = \left(\frac{y}{B} \times \left(1 - \frac{y}{B} \right) \right) \cdot U_o$$



1) Calculate the shear stress at y = 0m, and y = 0.05m (viscosity of water: 0.001 N•s/m^2)
2) If the width of the channel is 1m (the direction into the paper), calculate the volume rate (m^3/s) and mean velocity (m/s) of the flow.

2. If the rectangular gate shown in figure is attached to a horizontal shaft at its midpoint, what torque would have to be applied to the shaft to open the gate ? The rectangular conduit and gate are both 3m wide, and l=5m.

(The density of water is 1000 kg/m^3, g = 9.81m/s^2, moments of inertia of plane: $I = \frac{bh^3}{12}$, where b is the width and h is the height)



3. The open tank shown in figure has a constant inflow discharges of 20 ft^3/s, A 1.0 ft diameter drain provides a variable outflow velocity equal to $\sqrt{2gh}$ ft/s. What is the equilibrium height h_{eq} of the liquid in the tank ? (g : 32.2 ft/s^2)