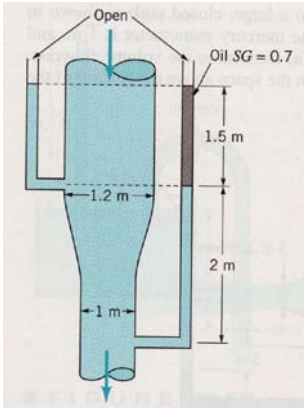
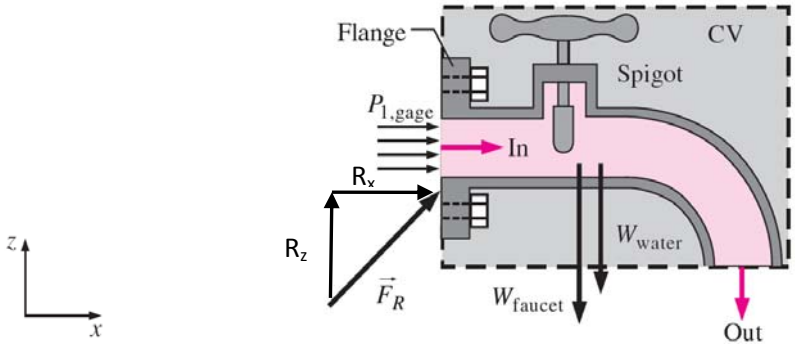
ID:----------	**Midterm 1**	**Time: 50 minutes**
Name: ----------	**Course: 58:160, Fall 2009**	

1. Water flows steadily downward in the pipe shown in figure with negligible losses. Determine the flow rate. (ρ_{water}=1000kg/m^3)



2. Water flows at a rate of 0.001m^3/s through a flanged faucet with a partially closed gate valve spigot. The inner diameter of the pipe at the location of the flange is 2 cm, and the pressure at that location is measured to be 30 KPa. The total weight of the faucet assembly plus the water within it is 6N. Calculate the horizontal and vertical R_z forces on the flange. (ρ_{water}=1000kg/m^3)



3. A large lawn sprinkler with four identical arms is to be converted into a turbine to generate electric power by attaching a generator to its rotating head, as shown in figure. Water enters the sprinkler from the base along the axis of rotation at a rate of 0.02 m^3/s and leaves the nozzles in the tangential direction. The sprinkler rotates at a rate of 300 rpm in a horizontal plane. The diameter of each jet is 1 cm, and the normal distance between the axis of rotation and the center of each nozzle is 0.6 m. Estimate the electric power produced. (ρ_{water}=1000kg/m^3)