Solution for HW4

**S4.1**

We consider steady flow of an ideal fluid.

Take the control volume as the plate and a portion of water striking it.

**Continuity Equation.**

**Relative Velocity.**

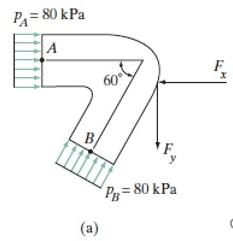
Relative to the control volume, the velocity at B is

Thus, the relative flow onto the plate is

**Linear Momentum.**

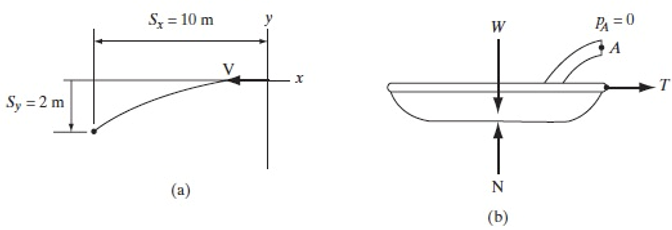
Referring to the free-body diagram of the control volume in Fig. a,

**S4.2**



**S4.3**

The maximum force developed in the tie rope occurs when the velocity ofthe flow is maximum. This happens when the flow achieves the maximum range, ie, . Consider the vertical motion by referring to Fig. a.



**S4.4**

The flow is steady and the water can be considered as an ideal fluid (incompressible and inviscid). Hence Average velocities are used and. The control volume contains the water in the pipe and the tank and it is fixed instantaneously, Fig. a.

Equilibrium of the FBD of the tank, Fig. b, requires

Thus, the compression of the spring is

