

Fluid Engineering (Group A) [10:45~12:15]

Examinee's number _____

Score _____

Consider that a liquid flowing pipe with a diameter D_A branches into two pipes, and then the branched pipes merge, as shown in Figure 1. The diameters and the lengths along each flow of the branched pipes are D_A and D_B , and l_A and l_B , respectively. The volumetric flow rate of the liquid is Q_A in one of the branched pipes whose diameter is D_A and Q in the merged pipe. Assume that all the pipes have the same friction factor causing head loss, and any losses other than the pipe frictions are negligible. Express Q by D_A , D_B , l_A , l_B , and Q_A .

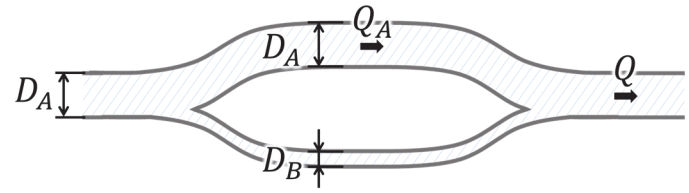


Figure 1

(25 Points)

Examinee's number _____

Score _____

II The two-dimensional water jet ejected horizontally into the atmosphere from the nozzle with the cross-sectional area of A collides with the upper surface of a stationary curved plate, and flows along the plate, and then flows away with the exit angle of the plate to the horizontal x -axis, θ , as shown in Figure 2. The density of water is denoted by ρ , and losses and gravity are assumed to be negligible. The velocity of ejected water is v . Answer the following questions. (25 Points)

- (1) Find the magnitude of the fluid force F acting on the curved plate and its direction α by using A , v , ρ and θ .
(20 points)
- (2) Find the exit angle of plate θ to maximize the horizontal x -component of the fluid force.
(5 points)

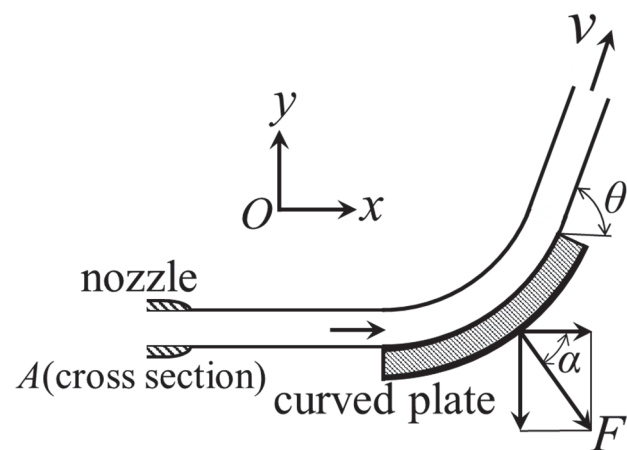


Figure 2