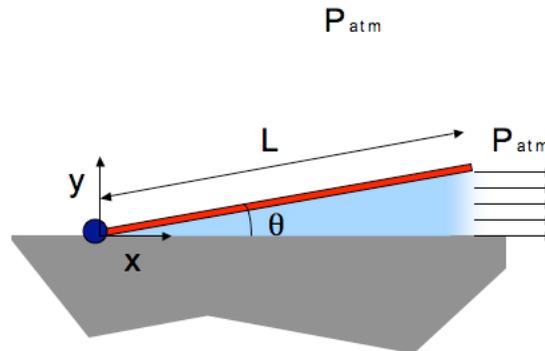


MIT Department of Mechanical Engineering
2.25 Advanced Fluid Mechanics

Problem 5.18

This problem is from “Advanced Fluid Mechanics Problems” by A.H. Shapiro and A.A. Sonin



A flat plate is hinged at one side to the floor, as shown, and held at a small angle θ_0 ($\theta_0 \ll 1$) relative to the floor. The entire system is submerged in a liquid of density ρ . At $t = 0$, a vertical force is applied and adjusted continually so that it produces a constant rate of decrease of the plate angle θ .

$$-\frac{d\theta}{dt} = \omega = Const, \tag{5.18a}$$

Assuming that the flow is incompressible and inviscid,

- (a) Derive an expression for the velocity $u(x, t)$ at point x and time t .
- (b) Find the horizontal force $F(t)$ exerted by the hinge on the floor (assume the plate has negligible mass).

MIT OpenCourseWare
<http://ocw.mit.edu>

2.25 Advanced Fluid Mechanics
Fall 2013

For information about citing these materials or our Terms of Use, visit: <http://ocw.mit.edu/terms>.