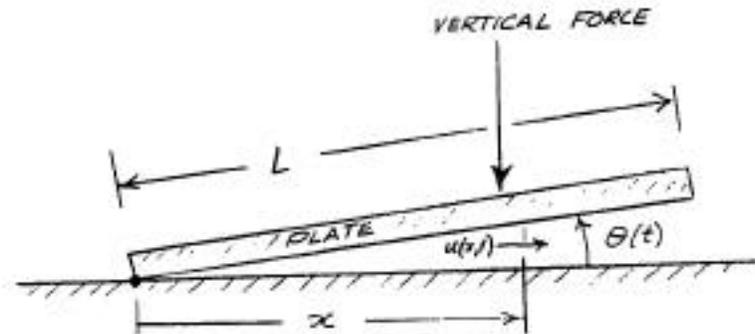


## Problem 5.15

*Hinged flat plate swung against wall*



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

$$\frac{d\theta}{dt} = -\omega .$$

Assuming that the flow is incompressible and inviscid, derive expressions for

(a) the horizontal velocity  $u(x,t)$  at point  $x$  and time  $t$

HINT

ANSWER

(b) the  $x$ -direction force  $F_H(t)$  exerted by the hinge on the floor. Assume the plate has negligible inertia.

HINT

HINT 2

ANSWER