Chapter 02: pressure and fluid statics.

Exercises series Number: 02

Exercise 01:

Consider a reservoir of water at 20^oC as in **Figure.1**. A vertical hinged gate (AB) holds back the water. The gate has a depth of $\boldsymbol{b = 3.0m}$ (into the page). **1)** Calculate the total force (F) on gate AB. **2)** Find the distance of the line of action of force (F) from the hinge at point A.

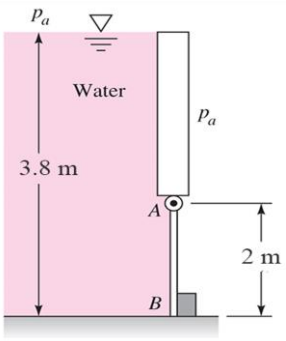

Figure 1

Exercise 02:

GIVEN The 4-m-diameter circular gate of **Figure.2** is located in the inclined wall of a large reservoir containing water with a density of ($\boldsymbol{\gamma = 9.8kN/m^3}$). The gate is mounted on a shaft along its horizontal diameter, and the water depth is 10m above the shaft. 1) Determine the magnitude and location of the resultant force exerted on the gate by the water. 2) Find the moment that would have to be applied to the shaft to open the gate.

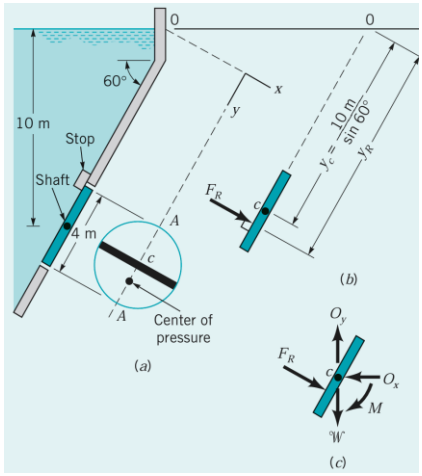

Figure 2

Exercise 03:

A heavy car plunges into a lake during an accident and lands at the bottom of the lake on its wheels **Figure.3.** The door is **1.2 m** high and **1 m** wide, and the top edge of the door is **8 m** below the free surface of the water. **1)** Determine the hydrostatic force on the door and the location of the pressure center, and discuss if the driver can open the door.

Exercise 04:

Water ($\boldsymbol{\rho = 9.8kg/m^3}$) is contained behind a rigid L-shaped gate (ABC) as in **Figure.4**. The gate has a depth of **0.5 m** (into the page). The gate rotates about a hinge at point **A**. Neglect the weight of the gate. **1)** Draw a fully-labelled free body diagram of the gate. **2)** Calculate the minimum vertical force (F_B) applied at point B required to keep the gate from opening.

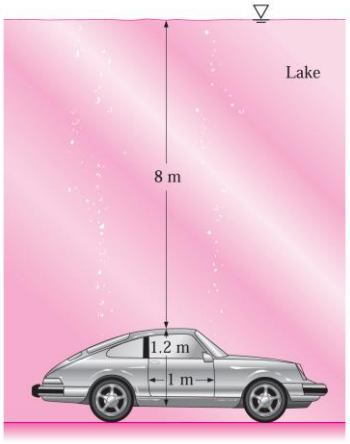

Figure 3

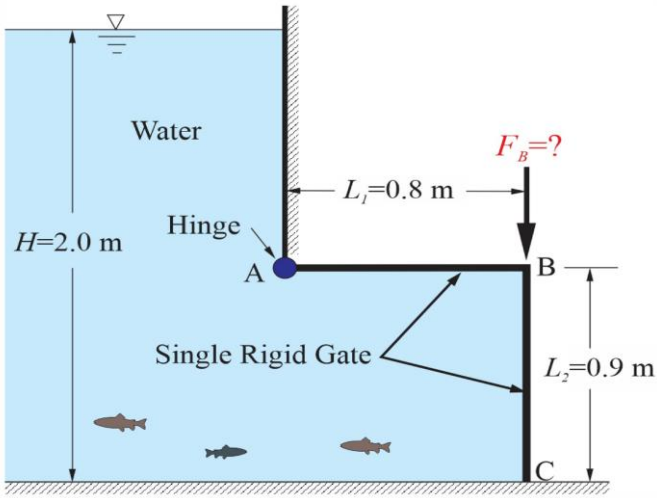

Figure 4