PRESSURE AND FLUID STATICS

1. **A 5-m-high, 4-m-wide rectangular plate blocks the end of a 4-m-deep freshwater channel, as shown in Fig.1. The plate is hinged about a horizontal axis along its upper edge through a point A and is restrained from opening by a fixed ridge at point B. Determine the force exerted on the plate by the ridge.**

2. **A 1-m-diameter cylindrical mass, M, is connected to a 2-m-wide rectangular gate as shown in Fig. 2. The gate is to open when the water level, h, drops below 2.5 m. Determine the required value for M. Neglect friction at the gate hinge and the pulley.**

3. **The 200-kg, 5-m-wide rectangular gate shown in Fig. 3 is hinged at B and leans against the floor at A making an angle of 45° with the horizontal. The gate is to be opened from its lower edge by applying a normal force at its center. Determine the minimum force F required to open the water gate.**

4. **A long solid cylinder of radius 0.8 m hinged at point A is used as an automatic gate, as shown in Fig. 4. When the water level reaches 5 m, the gate opens by turning about the hinge at point A. Determine (a) the hydrostatic force acting on the cylinder and its line of action when the gate opens and (b) the weight of the cylinder per m length of the cylinder. (*EXAMPLE 3–9*)**

5. **The dam AB shown in the Fig. 5 consists of a vertical plane and a quadrant cylinder. Find the resultant force per m width and its point of action.**

6. **A 3-m-high, 6-m-wide rectangular gate is hinged at the top edge at A and is restrained by a fixed ridge at B. As shown in Fig. 6 determine the hydrostatic force exerted on the gate by the 5-m-high water and the location of the pressure center. (3–139)**

7. **The homogeneous gate shown in Fig. 7 consists of one quarter of a circular cylinder and is used to maintain a water depth of 4 m. That is, when the water depth exceeds 4 m, the gate opens slightly and lets the water flow under it. Determine the weight of the gate per meter of length.**

8. **For the closed tank in Fig. 8, fluids are at 20°C, and the air space is pressurized The net outward hydrostatic force on the 30-cm by 40-cm panel at the bottom of the water layer is found to be 8450 N. (i) Estimate the pressure in the air space and (ii) the reading h on the mercury manometer. take oil density as 876 kg/m3.**

9. **A 4-m-long quarter-circular gate of radius 3 m and of negligible weight is hinged about its upper edge A, as shown in Fig. 9. The gate controls the flow of water over the ledge at B, where the gate is pressed by a spring. Determine the minimum spring force required to keep the gate closed when the water level rises to A at the upper edge of the gate. (3–75)**

10. **Gate ABC is 1.2m wide is hinged at B. Determine the force F required to balance the gate as shown in Fig. 10.**

11. **For the shown ABC gate at Fig. 11 determine the value and the point of application for the horizontal force, and then evaluate the value of the vertical force.**

Figures

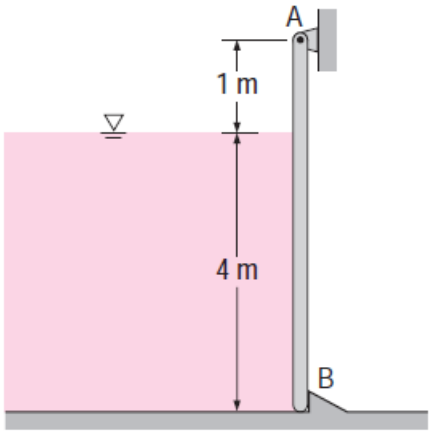

Fig.1

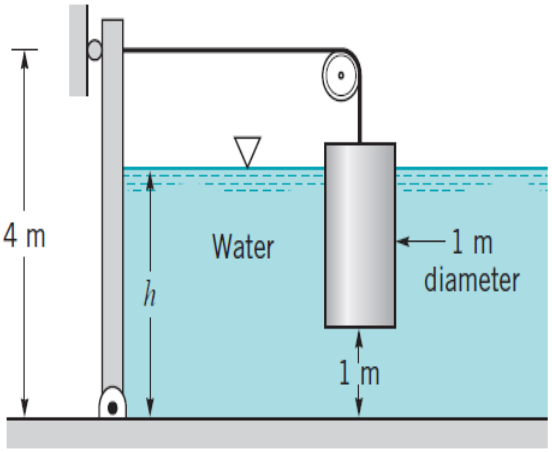

Fig.2

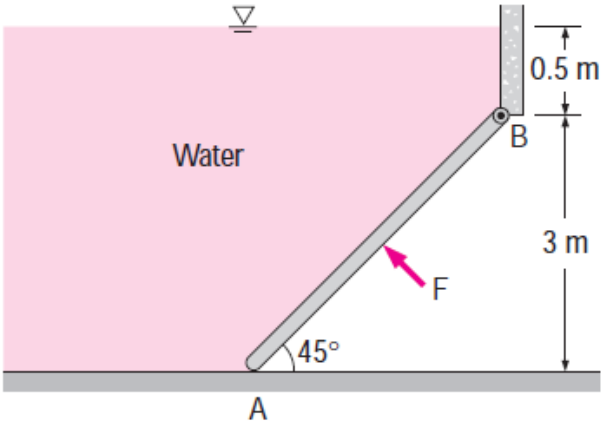

Fig.3

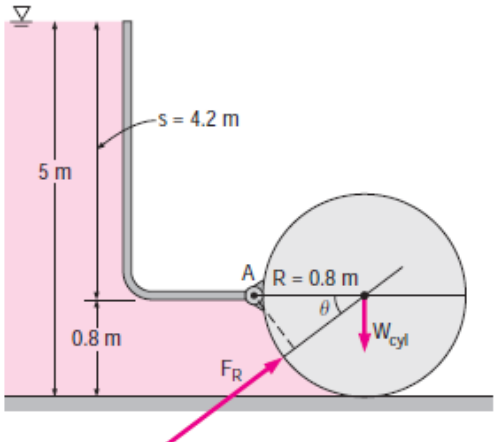

Fig.4

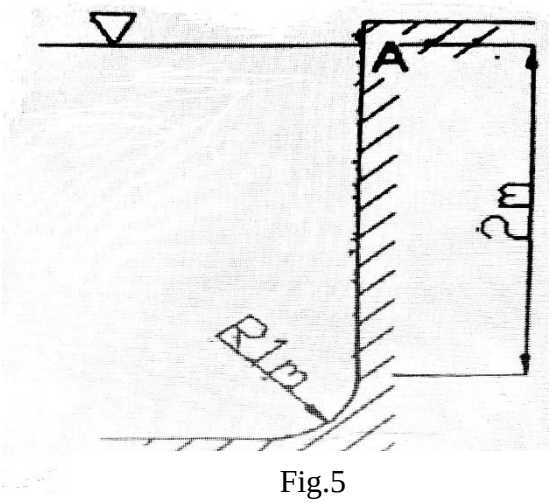

Fig.5

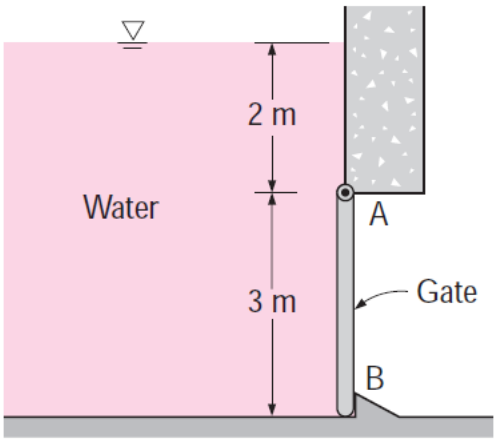

Fig.6

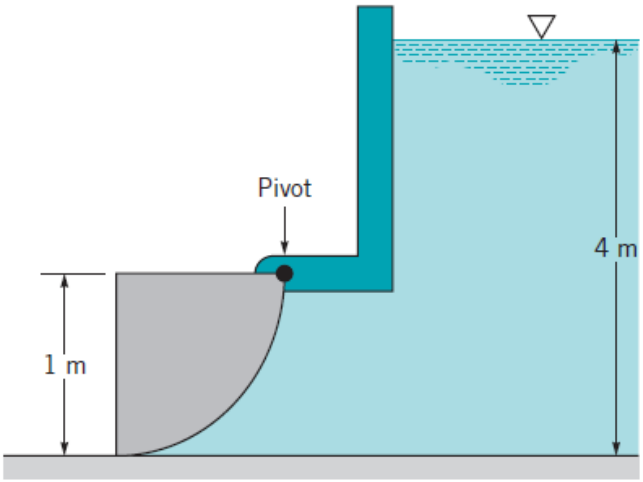

Fig.7

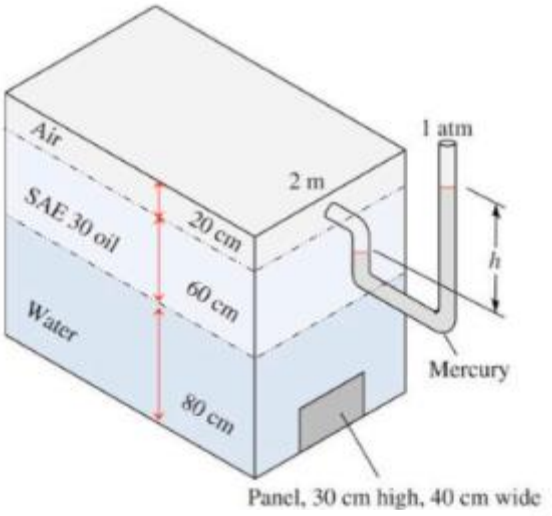

Fig.8

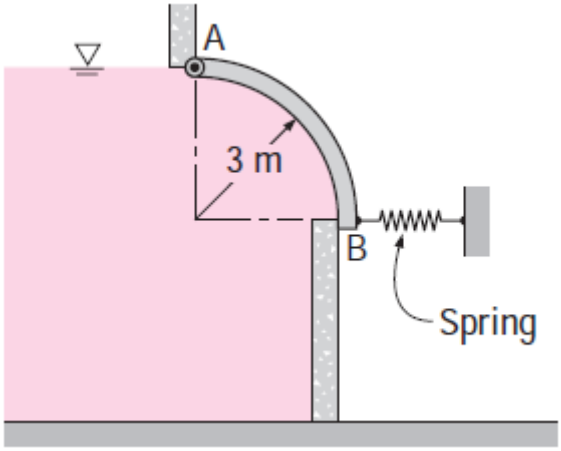

Fig.9

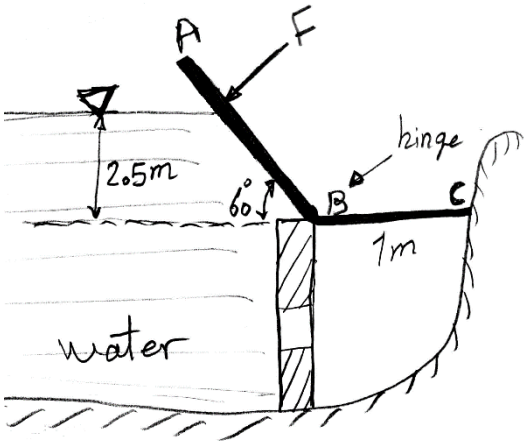

Fig.10

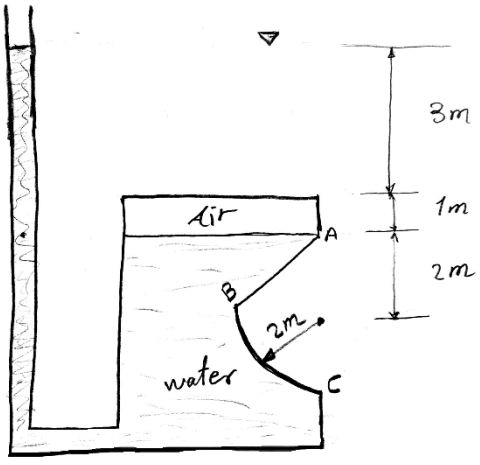

Fig.11