



Answer all the following questions.

Question (1)

a- A cylindrical shaft 9.96 cm diameter can turn in a bearing 15 cm long having an internal diameter of 10 cm. The space between the cylinder and the bearing is filled with oil having a viscosity of 0.8 Pa.s. Find the power loss in the bearing if the shaft rotates at 250 rpm.

[5 Marks]

b- Determine the gage pressure at point A in Fig. 1.

[5 Marks]

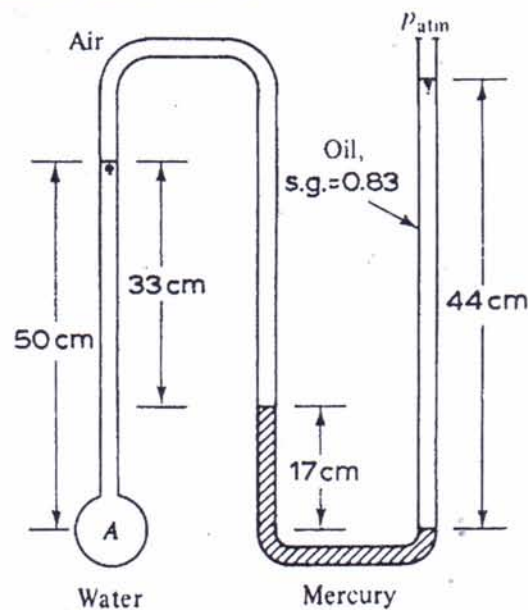


Fig. 1

Question (2)

a- Panel BC in Fig. 2 is circular. Compute (1) the hydrostatic force of the water on the panel; (2) its center of pressure; and (3) the moment of this force about point B.

[8 Marks]

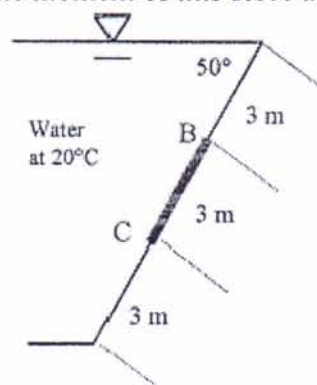


Fig. 2

b- The can in Fig. 3 floats in the position shown. What is its weight in N?

[4 Marks]

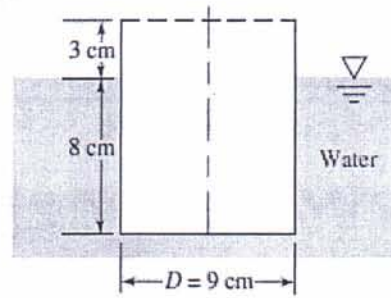


Fig. 3

Question (3)

a- A cylindrical tank with a diameter D is filled with water to a level H . At a time $t = 0$, a small opening with an area A_e is opened at the bottom. Develop a formula for the time required to empty the tank. If the diameter of the tank $D = 20$ cm, $H = 80$ cm, and the opening area A_e is 3 cm², calculate how long it will take to empty the container. [6 Marks]

b- A Venturimeter having a throat diameter of 150 mm is installed in a horizontal 300 mm diameter water main. The coefficient of discharge is 0.982. Determine the pressure difference (in Kpa) between the water main and the throat if the discharge is 0.142 m³/sec. [10 Marks]

Question (4)

A pipe system shown in Fig. 3 carries water from a reservoir and discharges it as a free jet. How much flow is to be expected through a 200 mm steel commercial pipe with the fittings shown? Take $f = 0.015$ [12 Marks]

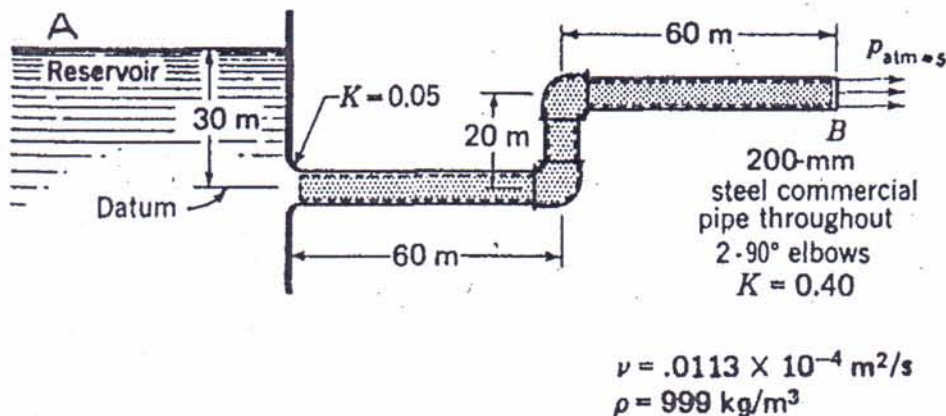


Fig. 3

Good Luck

Dr. Mohamed Mansour