Mansoura University		1^{st} year Prod. Eng.
Faculty of Engineering		May 2013
Dept. of Power Mech. Eng.		Exam Type: Final
Course Title: Fluid Mechanics		Time: 2 Hours
Course Code: MPE5126		Full Mark: 60

Answer all the following questions.

Question (1)

a- A shaft 6.00 cm in diameter and 40 cm long is pulled steadily at $V = 0.4$ m/s through a sleeve 6.02 cm in diameter. The clearance is filled with oil, $\nu = 0.003$ m^2/s and $SG = 0.88$. Estimate the force required to pull the shaft. [8 Marks]

b- In Fig. 1 water ($\gamma_{water} = 9790$ N/m^3) and gasoline ($\gamma_{gasoline} = 6670$ N/m^3) are open to the atmosphere and are at the same elevation. What is the height h in the third liquid? [9 Marks]

Question (2)

a- Panel BC in Fig. 2 is circular. Compute (a) the hydrostatic force of the water on the panel; (b) its center of pressure. [10 Marks]

b- The tank of liquid in Fig. 3 accelerates to the right with the fluid in rigid-body motion. (i) Compute a_x in m/s^2 (ii) Determine the gage pressure at point A if the fluid is water. [8 Marks]

Question (3)

Water flows steadily through a closed tank, as in Fig. 4. At section 1, D_1 = 6 cm and the volume flow is 100 m^3/h. At section 2, D_2 = 5 cm and the average velocity is 8 m/s. If D_3 = 4 cm, what is (a) Q_3 in m3/h and (b) average V_3 in m/s? [9 Marks]

Question (4)

a- A 10-cm-diameter hose maintained at a pressure of 1600 kPa provides water from a tanker to a fire. There is a nozzle on the end of the hose that reduces the diameter to 2.5 cm (Fig. 5). Estimate the force that the water exerts on the nozzle. The losses can be neglected in a short nozzle. [10 Marks]

b- Mercury flows through 4 meters of 7-mm-diameter glass tubing at an average velocity of 5 m/s. Estimate the head loss in meters and the pressure drop in kPa take $f = 0.0143$. [6 Marks]

P.T.O.

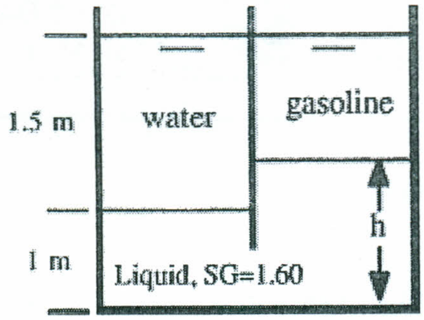

Fig. 1

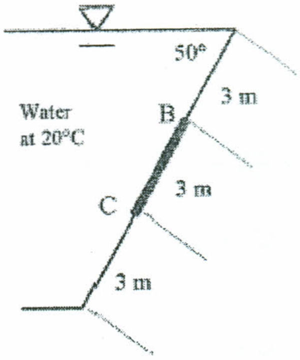

Fig. 2

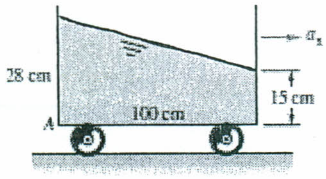

Fig. 3

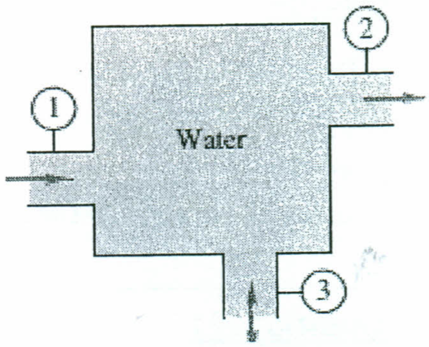

Fig. 4

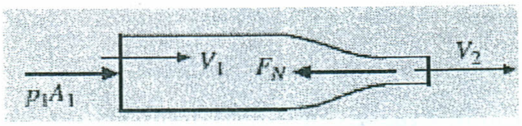

Fig. 5

Good Luck *Dr. Mohamed Mansour*