Egyptian Russian University
Faculty of Engineering,
Mechatronics and Robotics Program

Fluid Mechanics ME102
Mid Exam, Spring2021
Time: 30 minutes

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Problem 1 (10 Points)

Consider laminar flow of a Newtonian fluid of viscosity μ between two parallel plates shown in Fig (1). The flow is one- dimensional, and the velocity profile is given as $u(y)= 4u_{max} [y/h\text{-} (y/h)^2]$, where y is the vertical coordinate from the bottom surface, h is the distance between the two plates, and u_{max} is the maximum flow velocity that occurs at midplane. Develop a relation for the friction force exerted on both plates by the fluid in the flow direction per unit area of the plates.
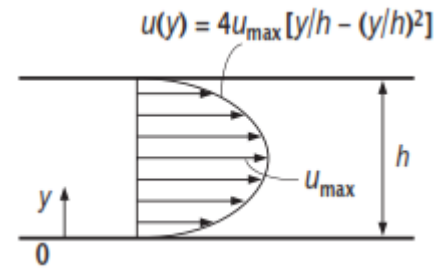
$$u(y) = 4u_{max}[y/h - (y/h)^2]$$

Fig (1)

Problem 2 (10 Points)

Two chambers with the same fluid at their base are separated by a piston whose weight is 25N as shown in Fig (2). Calculate the gage pressures in chambers A and B.
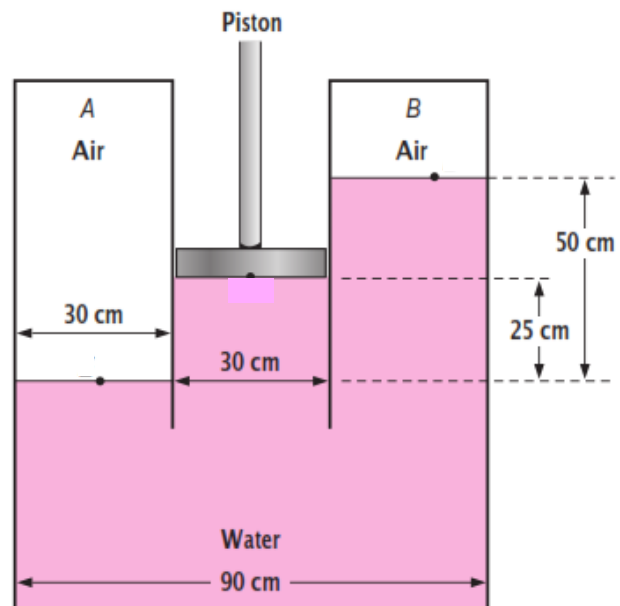
Piston

A
Air

B
Air

50 cm

30 cm

25 cm

30 cm

Water

90 cm

Fig (2)