Department of Applied Mechanics, IIT Delhi
APL-107 Mechanics of Fluids (2016-2017 I Sem)
Minor Test #1
30 Aug 16, 11:00 am - 12:00 noon, Room LH-121
Maximum marks: 20

1. The system in Fig. 1 is open to *1 atm* on the right side. (*a*) If L = 120 cm, what is the air pressure in container A? (*b*) Conversely, if p_A = 135 kPa, what is the length L? (take p_{atm} = 101350 Pa, $\gamma_{mercury}$ = 133100 N/m^3 and γ_{water} = 9790 N/m^3 and neglect hydrostatic pressure variation in air).

[4 + 4 = 8]

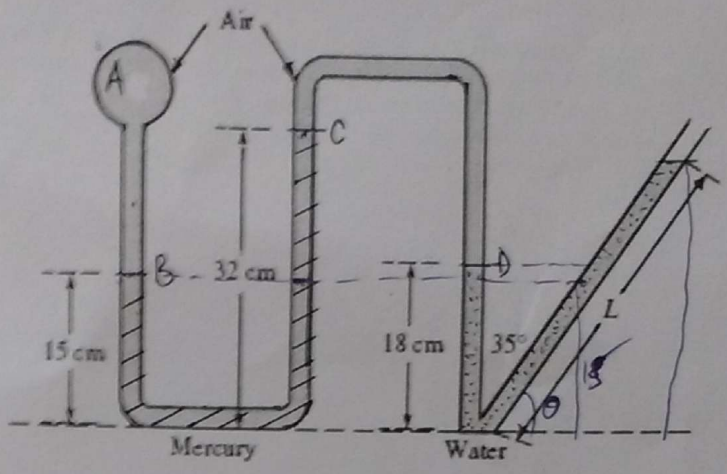

Fig. 1

2. A wedge splits a sheet of water (Fig. 2). Both wedge and sheet are very long into the paper. If the force required to hold the wedge stationary is F = 124 N per meter of depth into the paper, what is the angle of the wedge?

[6]

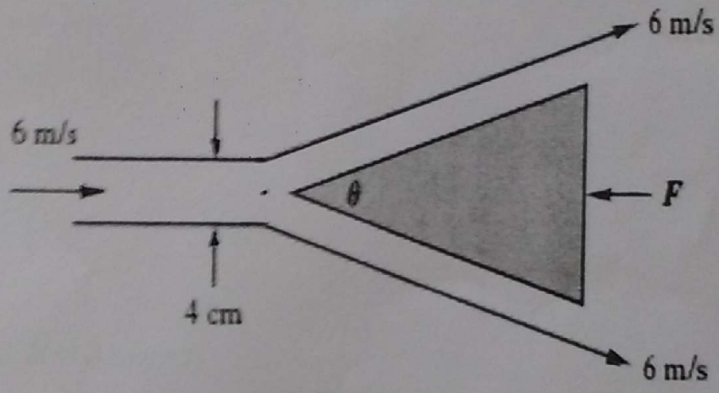

Fig. 2

3. Water is pumped at 5.7 m^3/min from the lower to the upper reservoir (Fig. 3). The pipe friction losses are approximated by $h_f \approx 27V^2/(2g)$, where V is the average velocity in the pipe. If the pump is 75 percent efficient, what power is needed to drive it?

[6]

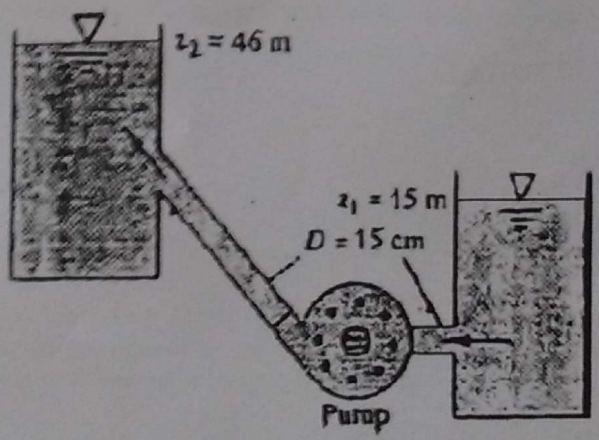

Fig. 3