FLUID MECHANICS I - Training problems in fluid statics

**1)** Calculate components of the hydrostatic force exerted on the flap. What is the minimal force F preventing the flap from opening? What is corresponding reaction force in the hinge?

A)

B)

c)

d)

e)

f)
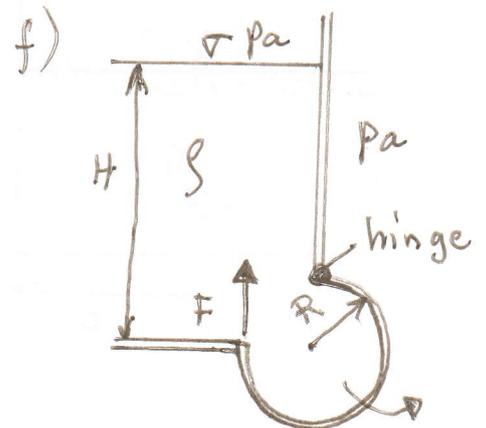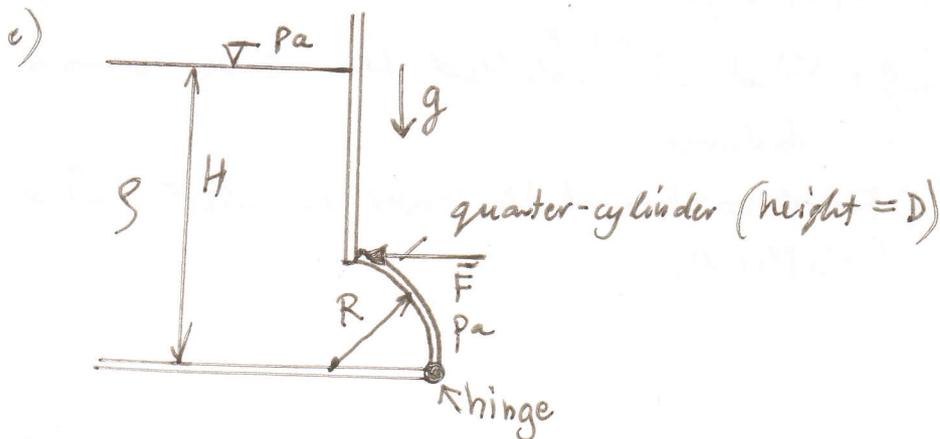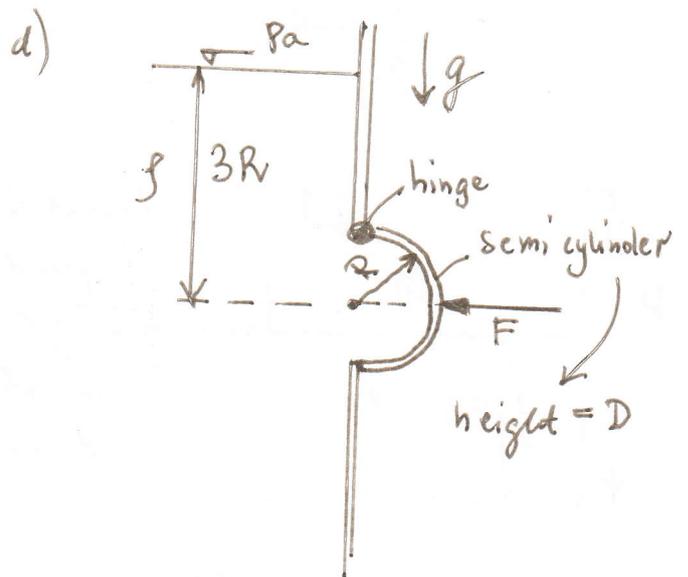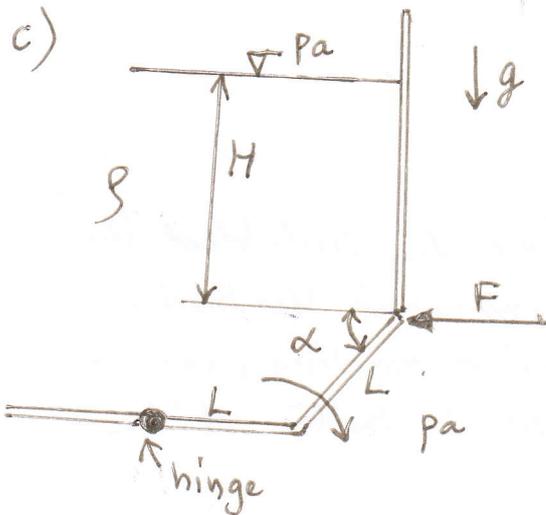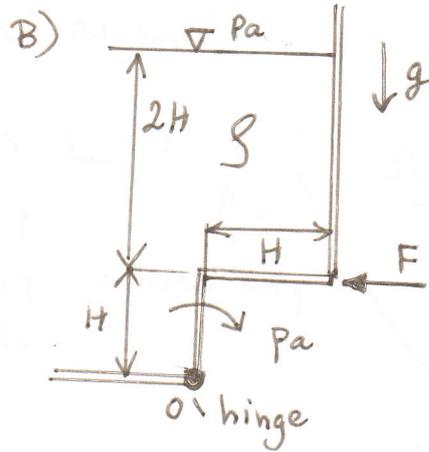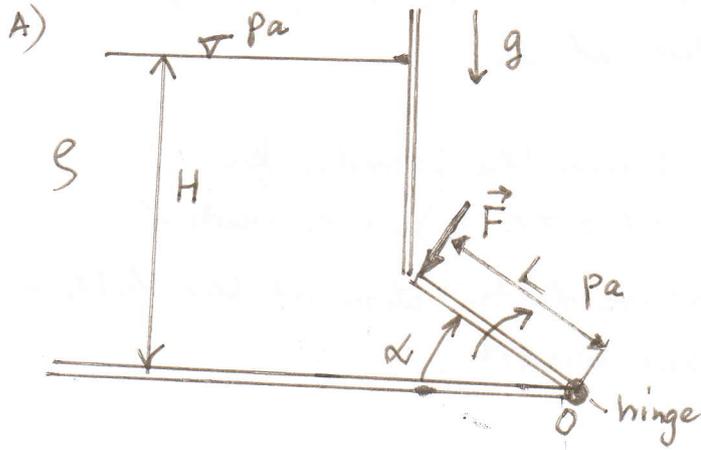
Suggestion - solve each problem by direct integration and then by „smart" approach.

2)
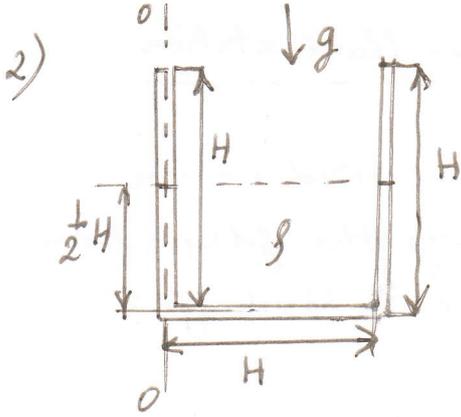
no rotation:

U-pipe with water (density ϱ) is filled as shown. When it rotates with the angular velocity Ω 25% of the initial volume is thrown out of the pipe. Find the value of Ω.

3)

no rotation
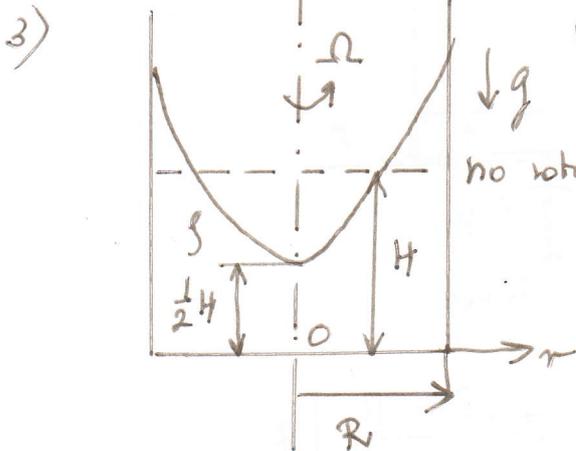
Find Ω. Derive the formula for
$$p = p(z=0, r),$$ i.e. radial pressure distribution at the bottom of the bucket.

4)

no rotation
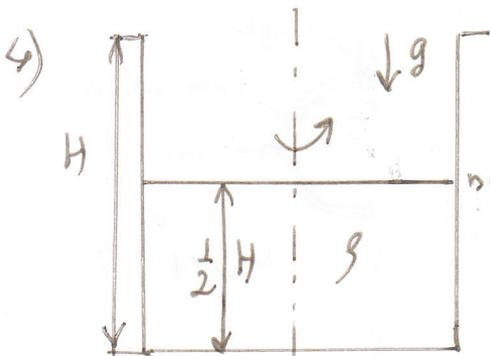
What is the maximal Ω such that the liquid is not flowing outside the bucket? Calculate corresponding pressure distribution at the bottom of the bucket.

5)
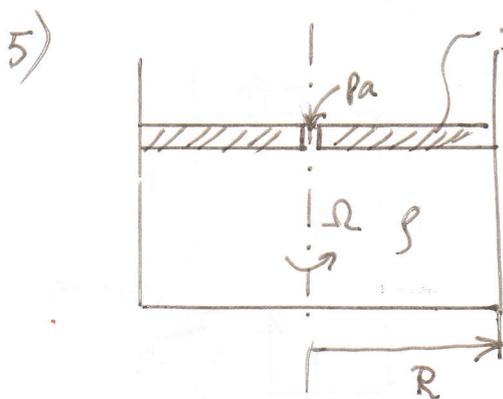
floating cover, mass M

1) Find $\Omega = \Omega_*$ such that the cover remains in balance.

2) Find position of the cover if $\Omega = 2\Omega_*$ (difficult).