



ASSIGNMENT No. 4

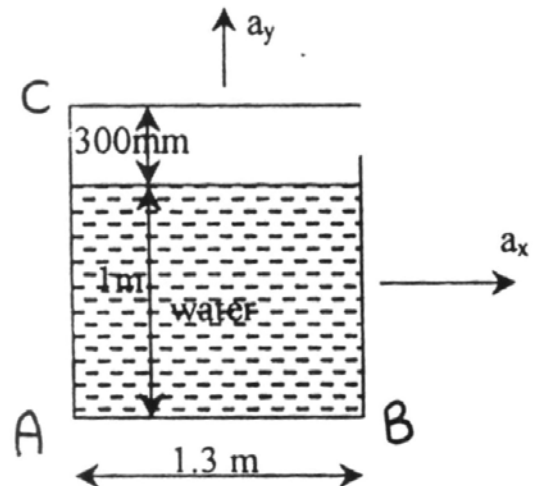
I. Fluids in Relative Equilibrium

II. Buoyancy & Floatation

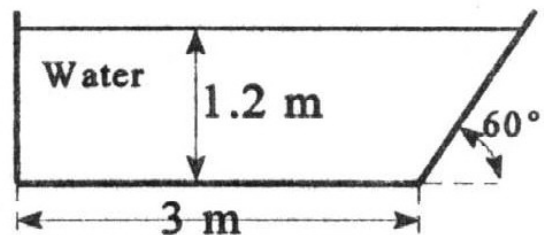
I) Fluids in Relative Equilibrium

1. In the shown figure, find the pressure at points A, B and C in the following cases:

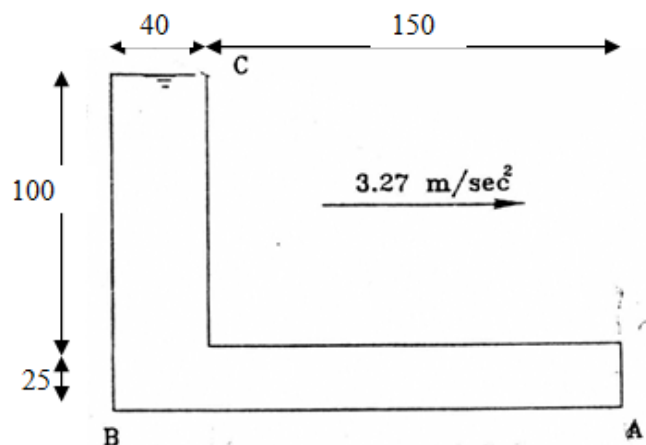
- $a_x = 9.81 \text{ m/s}^2$ and $a_y = 0.00 \text{ m/s}^2$
- $a_x = 0.00 \text{ m/s}^2$ and $a_y = 9.81 \text{ m/s}^2$
- $a_x = 4.90 \text{ m/s}^2$ and $a_y = 0.00 \text{ m/s}^2$



2. Calculate the total force on the ends and the bottom of this container while at rest and when being accelerated vertically upward at 3.00 m/s^2 . The container is 2.00 m wide. Repeat your calculation for a downward acceleration of 6.00 m/s^2 .



3. The tank shown in figure is filled with water and is accelerated horizontally at 3.27 m/sec^2 . If the tank is closed and a small opening was left at C, then determine the pressure at points A and B.



4. A tank containing water moves horizontally with a constant linear acceleration of 3.50 m/sec^2 . The tank is 2.50 m long, 2.50 m high and the depth of water when the tank is at rest is 2.00 m . calculate:

- The slope of the water surface to the horizontal.
- The volume of spilled water when the acceleration is increased by 25%.
- The force acting on each side if $a_x = 12 \text{ m/s}^2$.

5. An open vertical cylindrical tank 2.00 meters high and 1.00 meter diameter contains 1.50 m of water. If the cylinder rotates about its geometric axis, find the constant angular velocity that can be applied when:

- The water just starts spilling over.
- The point at the center of the base is just uncovered and the percentage of water left in the tank in this case.

II) Buoyancy & Floatation

6. will a beam of S.G= 0.65 and length 1500 mm long with a cross section 136 mm wide and 96 mm height float in stable equilibrium in water with two sides horizontal?

7. An empty tank rectangular in plan (with all sides closed) is 12.50m long, and its cross section 0.70 m width and 0.60 m height. If the sheet metal weight 363 N/m^2 of the surface, and the tank is allowed to float in fresh water (Specific weight 9.81 KN/m^3) with the 0.60 m wedge vertical. Show, whether the tank is stable or not?

8. A wooden cylinder 60 cm diameter, S.G =0.50 has a concrete cylinder 60 cm long of the same diameter, S.G = 2.50 attached to the one end. Determine the length of wooden cylinder for the system to float in stable equilibrium with its axis vertical.

9. A spherical buoy (شندوره) floating ball has 0.50 m diameter, weights 500 N, and is anchored to the seafloor with a cable. Although the buoy normally floats on the surface, at certain times the water depth increase so that the buoy is completely immersed. What is the tension on the cable?

10. A right solid cone with apex angle equal to 60 degree is of density **K** relative to that of the liquid in which it floats with apex downwards. Determine what range of **K** is compatible with stable equilibrium.

11. A ship displacing 1000 ton has the shown horizontal cross section. Its center of buoyancy is 6.0 ft below water surface, and its center of gravity is 1.0 ft below water surface. Determine its metacentric height for rolling (about y-y axis) and for pitching (about x-x axis)>

