Solve all Problems with complete analysis, and assume any missing data.

Problem No (1) (10 Points):

The gate shown in **Fig. (1)** is rectangular and has dimensions 6 m by 4 m. What is the reaction at point A, (Point A is 3m deep under water surface)? Neglect the weight of the gate.

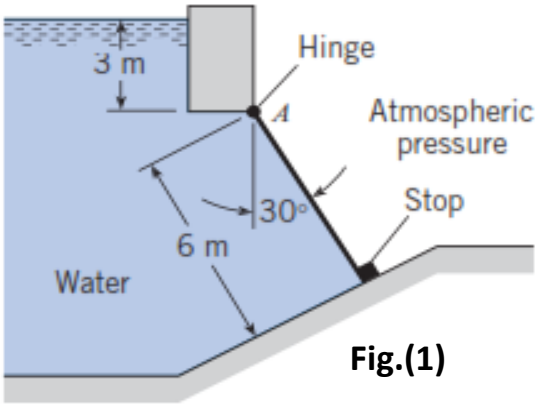

Fig.(1)

Problem No (2) (10 Points):

Consider the two-dimensional steady flow; $u = -(V_o / L)\,x$, $v = (V_o / L)\,y$, where V_o and L are constants. **(a)** Determine the acceleration field for this flow.
(b) Determine the streamline equation for this flow and sketch streamlines on x-y Cartesian coordinates.

Problem No (3) (15 Points):

The pipeline system shown in **Fig.2**, has a constant diameter of **d=20 cm**. If the flow rate, delivered by the pump, is measured using a venturi-meter with neck diameter of **10 cm** and it is discharged to atmosphere through a nozzle exit which has a diameter equals to the **neck diameter**. The manometer reading is equivalent to **30 cm-Hg (mercury)** head, and the pressure at the pipe inlet is **20 kpa**. Find: **(a)** The discharge **Q ,** in (m^3/sec). **(b)** The pump power **P ,** in (kW). **(c)** Sketch the **T.E.L.** and the **H.G.L.**
The liquid delivered is oil with **SG= 0.8** and elevations of different points are illustrated on the Figure. Assume all losses are neglected.

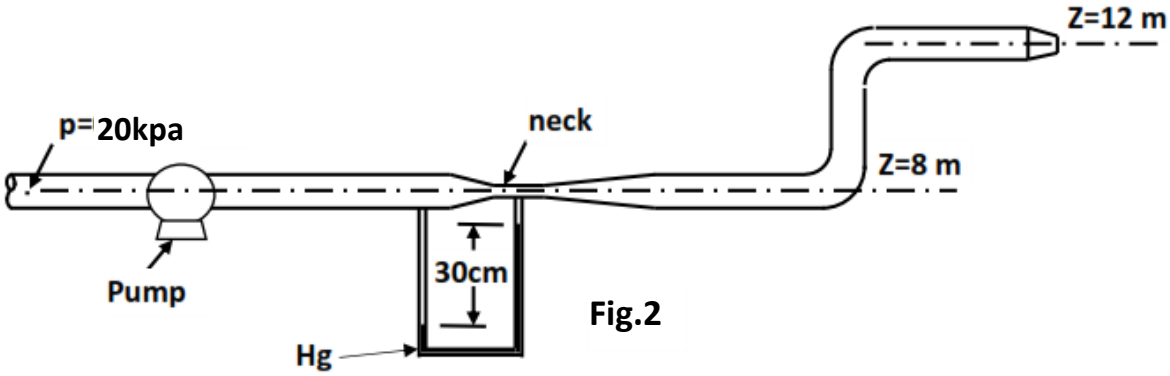

Fig.2

Problem No (4) (15 Points):

This "double" nozzle in **Fig. (3)**, discharges water into the atmosphere at rate of **0.5 m^3/s**. The inlet section pipe diameter is **30-cm**. Jet **A** is **10-cm** in diameter, jet **B** is **12-cm** in diameter. The water velocities in jet **A** and **B** are equals. If the nozzle is lying in a horizontal plan, and the flow is considered to be non-viscous; find both x and y-**components** of force acting through the flange bolts required to hold the nozzle in place?

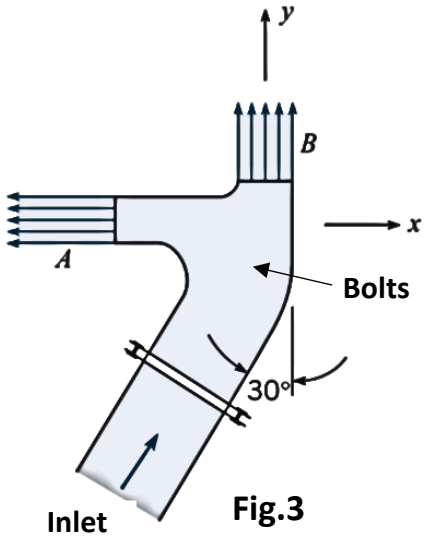

Fig.3