Fayoum University		2nd Year Electrical Engineering
Faculty of Engineering		Midterm Exam – Dec., 2015
Inustrial Engineering Dept.	Mechanical Engineering (2)	Full Marks: 60, Time:2 Hours

Answer all the following questions:

Question (1): [5 Marks]

Select the most appropriate answer from the multiple choices given:

1. **The fluid property, due to which, mercury does not wet the glass is**
   (a) viscosity
   (b) cohesion
   (c) surface tension
   (d) adhesion
2. **When the momentum of one fluid is used for moving another fluid, such a device is called a/an**
   (a) acid egg
   (b) jet pump
   (c) blower
   (d) none of these
3. **With increasing flow rate, the hydraulic efficiency of a centrifugal pump**
   (a) increases and then decreases.
   (b) remains constant.
   (c) decreases and then increases.
   (d) monotonically decreases.
4. **The velocity profile for laminar flow through a pipe is**
   (a) parabolic
   (b) linear
   (c) logarithmic
   (d) hyperbolic
5. **What causes cavitation in centrifugal pump ?**
   (a) High suction pressure
   (b) Low barometric pressure
   (c) Low suction pressure
   (d) High suction velocity

Question (2): [15 Marks]

Water is being fired at 10 m/s from a hose of 50mm diameter into the atmosphere. The water leaves the hose through a nozzle with a diameter of 30mm at its exit. Find the pressure just upstream of the nozzle and the force on the nozzle.

Question (3): [15 Marks]

A 5*m* wide tank with an L-shaped cross section, as shown in Figure (Q3), has a gate which is hinged at the top at it right hand end. If the tank is filled with water to a level of 8*m* determine the torque required at the hinge to just keep the gate closed. Determine also the force on the base of the tank and comment on why this is not the same as the weight of the water.

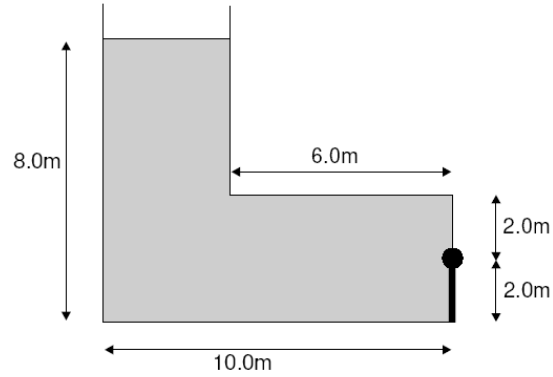

Fig. (Q3)

Question (4): [25 Marks]

oil at 20°C (ρ=870 kg/m^3; μ=0.104 kg/m.s.) flows through a 4 cm diameter vertical pipe as shown in the Figure (Q4). For the mercury (ρ=13550 kg/m^3) manometer reading h=42 cm shown for 3m of the pipe flow. (a) determine the direction of flow. (b) assume laminar flow and calculate the volume flow rate in m^3/h. (c) verify the laminar flow assumption.
(Friction loss head; $h_f = f\frac{L}{d}\frac{V^2}{2g}$; $f_{lam} = \frac{64}{Re_d}$)

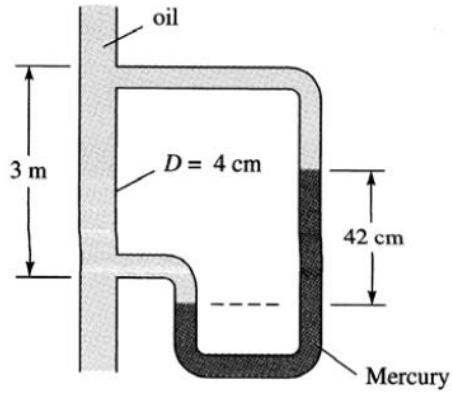

Fig. (Q4)

Best wishes

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