بسم الله الرحمن الرحيم

Mansoura University
Faculty of Engineering
Mech. Power Eng. Dept.

Fluid Mechanics
Total (60 Marks)

1st Year Production.
May 2012.
Time: 2 Hrs.

Answer **all the questions** - Assume reasonable values for ungiven data:

1- a) The equation of the velocity distribution for a certain flow is given by:

$$u = 5\,y - 6\,y^2 \qquad (m/s)$$

where y is the distance from the boundary in (m), the specific gravity of the fluid $S = 0.9$ and the kinematic viscosity $\nu = 3.52 \times 10^{-4}$ (m^2/s).

Find tangential shear stress (τ) at:

i) the boundary. *ii*) at 4 *cm* from the boundary. (10 Marks)

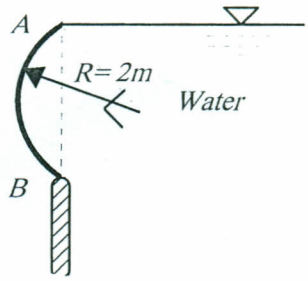

Fig. (1-b)

b) The gate AB shown in figure (1), is 3 (m) wide. Find:

i) the horizontal component of force and its line of action.
ii) the vertical component of force.
iii) the resultant force and its line of action. (10 Marks)

2-a) A uniform wooden cylinder has a diameter of 1 *m* and 3 *m* height. It's specific gravity is (S = 0.7). Checkup it's stability when floating over water. (10 Marks)

b) A circular jar 1 *m* in diameter and 2 *m* high contains water to a height of 1 *m*. The jar is rotated about its vertical axis at 180 *rpm*. Determine:

i) the height of the paraboloid of revolution from the base of the cylinder,
ii) the maximum pressure and its location, and
iii) the pressure at a point 0.2 *m* from the center and 0.25 *m* from the base. (10 Marks)

3-a) Water flows through the pump in Fig. 3-a at 0.06 m^3/s. Head losses between 1 and 2 are 2.5 *m* of water, and the pump delivers 4 *Kw* to the flow with efficiency of 90% . What should the mercury manometer reading h be? (10 Marks)

b) Determine the air pressure required to have a discharge of 100 *lit/s* through the pipe system shown in Fig (3-b). Assume (f = 0.02) in both pipes. Neglect minor losses. (10 Marks)

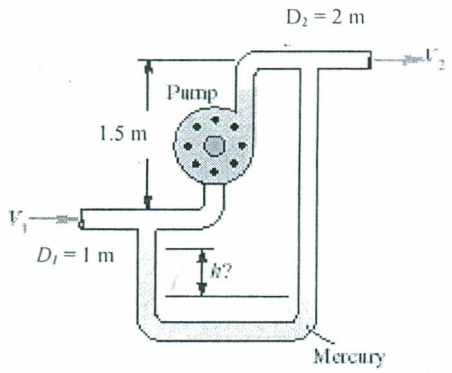

Fig 3-a

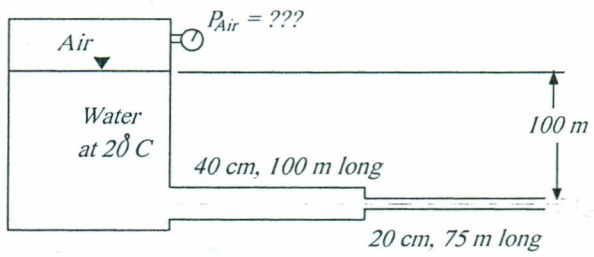

Fig 3-b

Good Luck ***Prof. Dr. M. Safwat.***