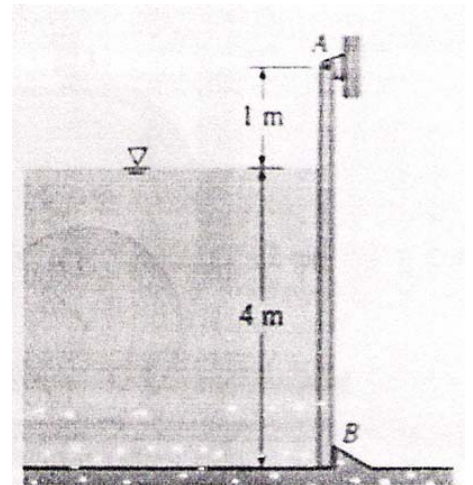
	Alexandria Higher Institute of Engineering & Technology (AIET)		
	Mechatronics Department		3 rd Year
	EME312	Fluid Mechanics	Final, June, 1, 2013
	Examiners:	Dr. Rola Afify and committee	Time: 3 hours

Answer the following questions:

Question one (12 marks)

- a) State the scientific expression of the following:-
- i. Weight per unit volume
 - ii. It is a substance which deforms continuously under the action of shearing forces.
 - iii. It is the pressure at which a liquid start to boil at working temperature.
 - iv. The fluid property that is measured by m^2/s .
 - v. It means frictionless flow, no energy is lost, and viscosity is considered Zero.
- b) A 5-m-high, 5-m-wide, rectangular plate blocks the end of a 4-m-deep freshwater channel as shown in figure. Draw the pressure distribution on the plate. Also, determine pressure force exerted on it and its line of action.



Question two (12 marks)

- a) Differentiate between:-
1. Piezometer tube and U-tube with one leg enlarged.
 2. Steady and unsteady flow.
 3. Friction and Eddy Losses.
- b) Two reservoirs are connected by a pipeline which is 150 mm diameter for the first 6 m and 225 mm diameter for the remaining 15 m. The entrance and exit are sharp and the change of section is sudden. The water surface in the upper reservoir is 6 m above that in the lower. Each pipe contains a bend ($k = 0.8$), take $f = 0.03$ for the 150 mm pipe and $f = 0.02$ for the 225 mm pipe. Calculate the discharge.

Question three (12 marks)

- a) Compare between Piston pump and Vane pump.
- b) A piston pump, pumping water, has three piston cylinders. Each cylinder has piston diameter of 100 mm and stroke of 300 mm. The pump speed is 500 rpm. The volumetric and mechanical efficiencies are 95% and 80% respectively. If the pump is working under a head of 20 m. Find the required shaft power.

Question Four (12 marks)

a) Explain how to avoid cavitation for non-positive displacement pump.

b) A centrifugal pump has the following performance at rotating speed of 2900 rpm:

Q (lit/s)	0	5	10	15	20	25
hm (m)	70	74	73	65	53	40
η (%)	0	60	76	72	58	41

If this pump is used in a system where the difference between delivery and suction levels (h_{st}) is 50 m and losses in suction pipe is 5 m and in delivery pipe is 10 m, kinetic energy is 0.2 and the pump is placed 3 m above suction level, calculate:

- i. The head required from pump.
- ii. The pump discharge.
- iii. The shaft power consumed at pump operating point.
- iv. The manometric suction head.

Question Five (12 marks)

a) What are the functions of the oil tank in a hydraulic circuit?

b) For the hydraulic circuit shown in figure, write the name of each component.

