



Assume any missing data, state your assumption clearly, and Answer all questions

Question: 1

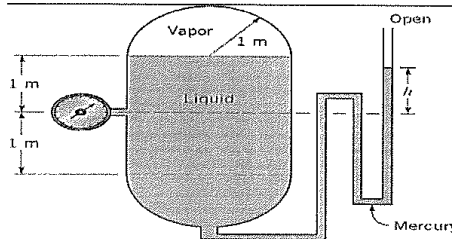
[15 Marks]

- (a) **What** is a fluid? How are fluids classified? (5 Marks)
- (b) **Name** some important properties of liquid? (5 Marks)
- (c) A rotating-cylinder viscometer consists of two concentric cylinders of diameters 5.0 cm and 5.04 cm, respectively. Find the viscosity of the tested oil which fills the gap between both cylinders to a height of 4.0 cm when a torque of 2×10^5 dyne.cm is required to rotate the inner cylinder at 2000 rpm. (5 Marks)

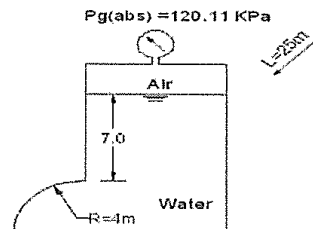
Question: 2

[15 Marks]

- (a) State and prove "Pascal's Law". (5 Marks)
- (b) The cylindrical tank with hemispherical ends shown in Figure contains a volatile liquid and its vapor. The liquid density 800 kg/m^3 is and its vapor density is negligible. The pressure in the vapor is 120 kPa (abs) , and the atmospheric pressure is 101 kPa (abs) . Determine: (a) the gage pressure reading on the pressure gage; and (b) the height, h , of the mercury manometer. (5 Mark)



- (c) Find the magnitude and location of the resultant force on the cylindrical arc shown in the Fig. if $P_g = 120.11 \text{ KPa (abs)}$ and the arc is 25m long (normal to the paper). (5 Marks)



Question: 3

[15 marks]

- (a) **Derive** an equation expressing the actual discharge of water with installing a orifice-meter a horizontal pipeline. (5 Marks)
- (b) A venturi-meter is installed in a 30 cm diameter vertical pipe conveying oil of $S = 0.9$. The throat diameter is 15.0 cm and the flow being upward. The difference in elevation between the throat and inlet is

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 Year: 2016-2017
 2nd year MPE Bylaw2007



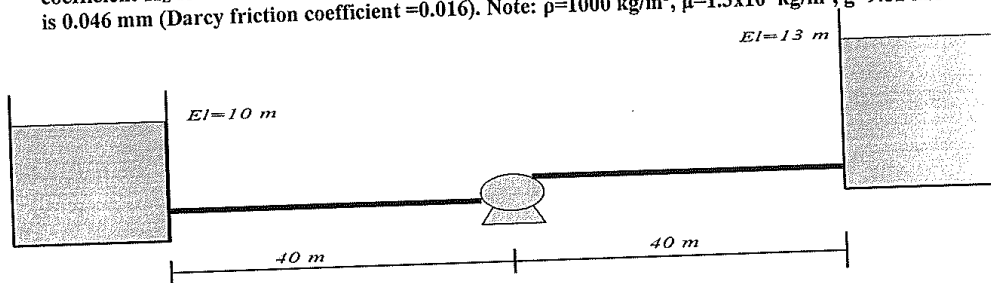
Subject: Fluid Mechanics
 Date: 10/01/2017
 Time allowed: 3hr
 Full Mark: 60
 Final Exam: 2 pages

30.0 cm. A mercury manometer connected to the Venturi registers a deflection of 20.0 cm. If $C_d = 0.96$, calculate the discharge and the pressure difference between the inlet and throat. If the discharge remains constant while the pipe is shifted to the horizontal position, how will the reading of the manometer be affected? (10 Marks)

Question: 4

[15 Marks]

- (a) What are losses in pipelines? Explain minor losses and major losses. (5 Marks)
- (b) If the flow of $0.1 \text{ m}^3/\text{s}$ of water is to be maintained in the system shown, what power must be added to the water by the pump? The pipe is made of new commercial steel and is 15 cm in diameter. The loss coefficient K_L for minor losses due to entrance and exit are 0.1 and 1.0, respectively. The wall roughness is 0.046 mm (Darcy friction coefficient = 0.016). Note: $\rho = 1000 \text{ kg/m}^3$, $\mu = 1.3 \times 10^{-3} \text{ kg/m}^3$, $g = 9.81 \text{ m/s}^2$



(c) In the following figure determine the flow in each pipe.

Pipe	CJ	BJ	AJ
Length (m)	2000	4000	1000
D(cm)	40	50	30
f	0.022	0.021	0.024

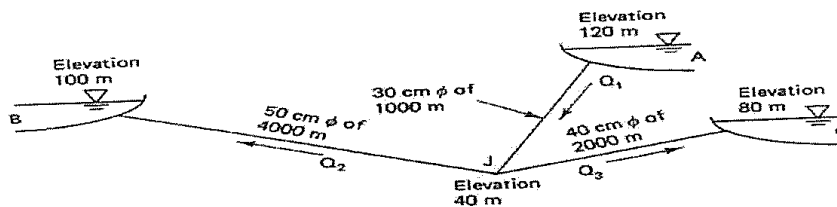


Fig. (4-c)

GOOD LUCK

Dr. Ismail Mohamed Sakr

Questions	1	2	3	4
ILO's	A8,A13,B1	A8,B1,B2,B3,A13	A8,B3,C5	A8,C1,B1