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CONFIDENTIAL

SET A

UNIVERSITI KUALA LUMPUR
Malaysia France Institute

FINAL EXAMINATION
JANUARY 2014 SESSION

SUBJECT CODE	:	FMD20202
SUBJECT TITLE	:	FLUID MECHANICS
LEVEL	:	DIPLOMA
TIME / DURATION	:	2 HOURS 12.45pm - 2.45pm
DATE	:	04 JUN 2014

INSTRUCTIONS TO CANDIDATES

1. Please read the instructions given in the question paper CAREFULLY.
2. This question paper is printed on both sides of the paper.
3. Please write your answers on the answer booklet provided.
4. Answer should be written in blue or black ink except forsketching, graphic and illustration.
5. This question paper consists of TWO (2) sections. Section A and B. Answer ALL questions in Section A. For Section B, answer TWO (2) questions only.
6. Answer all questions in English.

THERE ARE 5 PAGES OF QUESTIONS AND 2 PAGES OF APPENDICES, EXCLUDING THIS PAGE.

SECTION A (Total: 60 marks)

INSTRUCTION: Answer ALL questions.
Please use the answer booklet provided.

Question 1

(a) Define fluid mechanics.

(2 marks)

(b) State TWO (2) distinctions between mass and weight.

(4 marks)

(c) A cylindrical can 150 mm in diameter is filled to a depth of 0.1 m with a fuel oil. The oil has a mass 1.56 kg. Calculate its density, specific weight and specific gravity.

(14 marks)

Question 2

(a) A piston weighing 150 N slides down a vertical cylinder, as shown in *Figure 1*. The radial gap between the piston and cylinder is 0.05 mm. If the piston is decelerating at a rate of 1 m/s^2 when the velocity is 5 m/s, determine the absolute viscosity of the oil film between the piston and cylinder.

(7 marks)

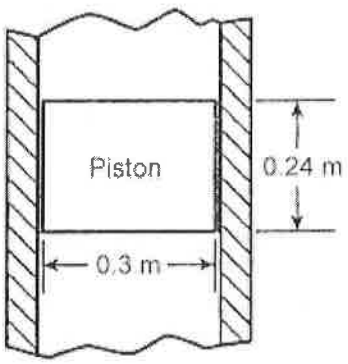


Figure 1

(b) A rigid cylinder of 100 mm diameter contains SAE 30 oil over water, as shown in *Figure 2* below. If a pressure of 1 MN/m² is applied, how far will the piston move downward?

(13 marks)

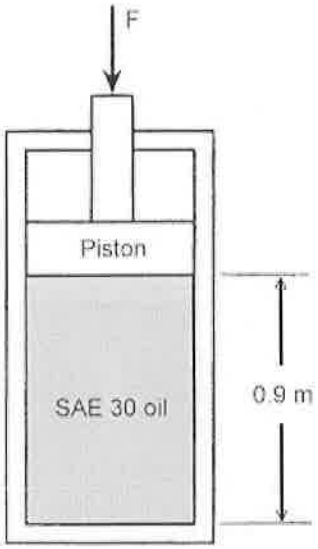


Figure 2

Question 3

(a) Define the different between gage and absolute pressure.

(2 marks)

(b) Express a pressure of 225 kPa (abs) as a gage pressure.

(6 marks)

(c) Determine the specific weight of the oil and the pressure at the bottom of the tank in *Figure 3* below.

(12 marks)

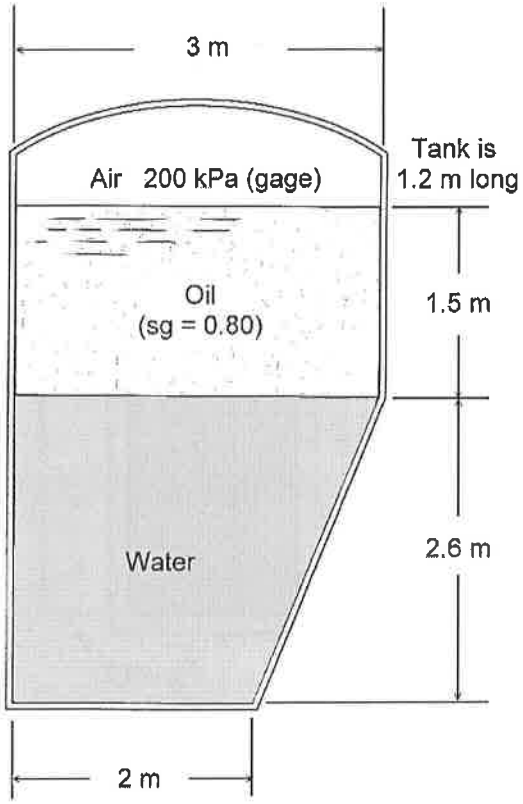


Figure 3

SECTION B (Total: 40 marks)

INSTRUCTION: Answer TWO (2) questions only.
Please use the answer booklet provided.

Question 4

Determine the pressure difference between pipes A and B for differential manometer shown in *Figure 4*.

(20 marks)

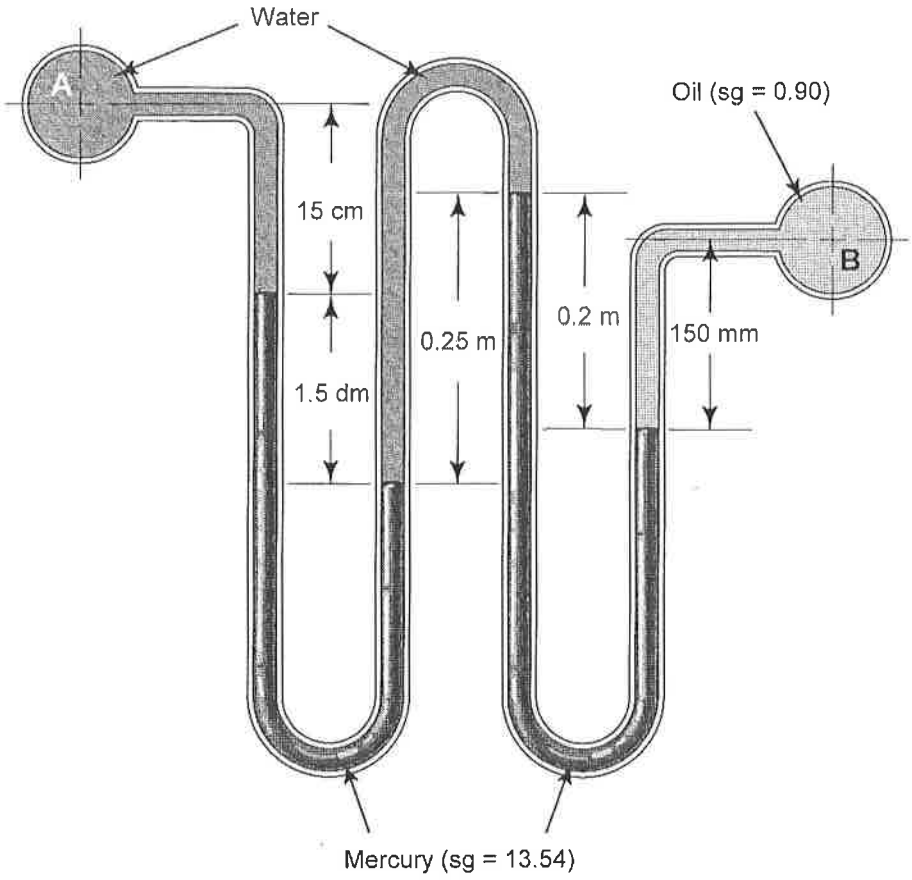


Figure 4

Question 5

If the wall in *Figure 5* is 4 m long, calculate the total force on the wall due to the oil pressure. Also determine the location of the center of pressure.

(20 marks)

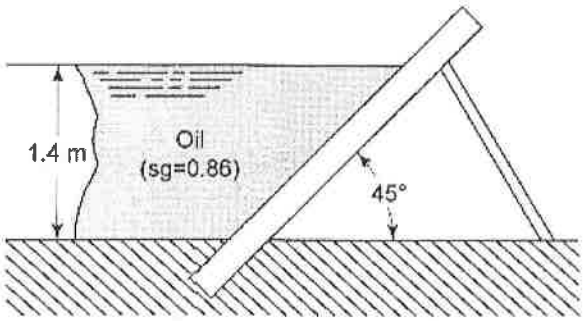


Figure 5

Question 6

Oil with a specific weight of 8.64 kN/m³ flows from A to B through the system shown in *Figure 6*. Calculate the volume flow rate of oil. The specific weight of water is 9.81 kN/m³.

(20 marks)

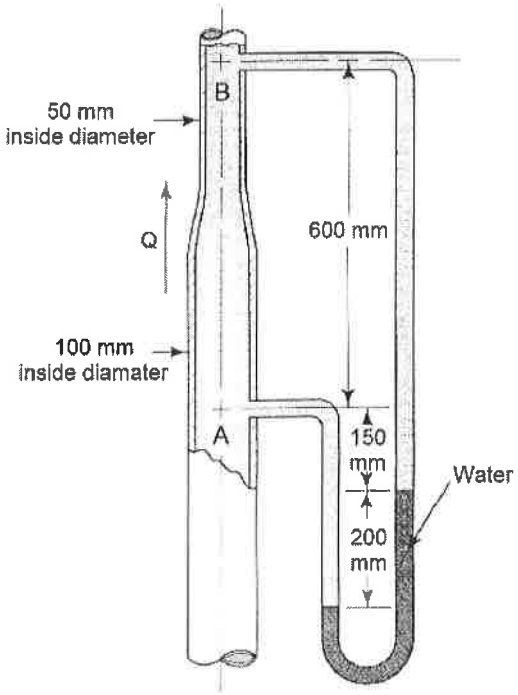


Figure 6

END OF QUESTION

APPENDICES: FORMULAE AND TABLES

$T(K) = T(°C) + 273$	Pascal's law → $P_1 = P_2$
$T(°F) = 1.8\ T(°C) + 32$	$P = F / A$
$T(°R) = 1.8\ T(K)$	$P = \rho.g.h$
$S_g = \gamma / \gamma_{waler\ at\ 4°C}$	$P = \gamma h$
$S_g = \rho / \rho_{waler\ at\ 4°C}$	$P_{abs} = P_{gage} + P_{atm}$
$\rho = \frac{P}{RT}$	$\beta = \frac{-\Delta P}{\Delta V / V}$
$R_{air} = 287 \frac{N.m}{2kg.k}$	$F = \mu (\frac{UA}{H})$
$V = \frac{\mu}{\rho}$	$F = PA = \gamma h A$
$\gamma = \frac{W}{V}$	$h_{cp} = \frac{\bar{I}_x}{hA} + \bar{h}$
$\rho = \frac{m}{V}$	$Q = VA$
$\rho = \gamma / g$	$Z_1 + P_1/\gamma + v_1^2/2g = Z_2 + P_2/\gamma + v_2^2/2g$

Table 1: List of Formulae.

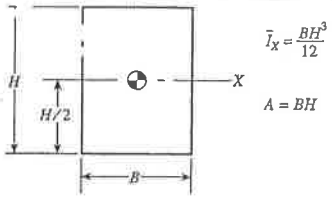
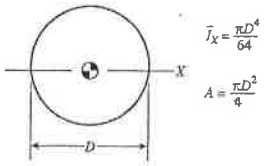
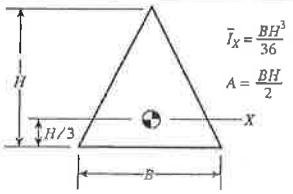
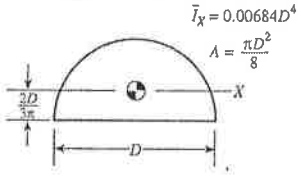
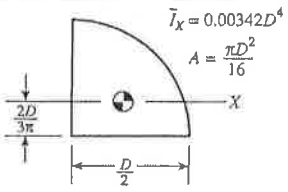
 Rectangle	 Circle
 Triangle	 Semicircle
 Quarter circle	

Table 2: Properties of some common plane areas.

Liquid	Specific weight γ (N/m^3)	Density ρ (kg/m^3)
Carbon tetrachloride	15,600	1,590
Ethyl alcohol	7,730	788
Gasoline	6,630	676
Mercury	133,000	13,600
SAE 30 oil	8,720	889
Seawater	10,050	1,024
Water	9,790	998

Table 3: Specific weight and density of common liquids. (SI units at 20°C)

Gas	Specific weight γ (N/m^3)	Density ρ (kg/m^3)
Air	12.0	1.23
Helium	1.63	0.166
Hydrogen	0.822	0.0838
Methane	6.54	0.667
Nitrogen	11.4	1.16
Oxygen	13.0	1.33

Table 4: Specific weight and density of common gases. (SI units at atmospheric pressure and 20°C)

Liquid	Bulk Modulus β (MPa)
Carbon tetrachloride	1,310
Ethyl alcohol	1,060
Gasoline	1,300
Mercury	28,500
SAE 30 oil	1,500
Seawater	2,340
Water	2,150

Table 5: Typical bulk modulus values of common liquids