



UNIVERSITI KUALA LUMPUR
Malaysia France Institute

FINAL EXAMINATION
JANUARY 2011 SESSION

SUBJECT CODE : FMD 20202
SUBJECT TITLE : FLUID MECHANICS
LEVEL : DIPLOMA
TIME / DURATION : 9.00am - 11.00am
(2.0 HOURS)
DATE : 14 MAY 2011

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 for sketching, 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) question only.
6. Answer all questions in English.
7. Useful tables are appended.

THERE ARE 4 PAGES OF QUESTIONS AND 1 PAGE OF APPENDIX, EXCLUDING THIS PAGE.

SECTION A (Total: 60 marks)

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

Question 1

- (a) What are the differences between liquid and gas? (5 Marks)
- (b) Calculate the mass of 5 cubic foot of water if it weighs 161 lb. (6 Marks)
- (c) Convert 80°C to
 - (i) degrees Fahrenheit
 - (ii) degrees Rankine
 - (iii) Kelvin temperature

(9 Marks)

Question 2

- (a) A volume of a rock is found to be 0.00025 m^3 . If the rock's specific gravity is 2.8, what is its weight? (8 Marks)
- (b) A piston moves inside a cylinder at a velocity of 15 m/s as shown in Figure 1 below. The 200 mm diameter piston is centrally located within the 200.6 mm inside diameter cylinder. The film of oil separating the piston from the cylinder has an absolute viscosity of $0.6 \text{ N}\cdot\text{s}/\text{m}^2$. Assuming a linear velocity profile, find the:
 - (i) Shear stress in the oil
 - (ii) Force F required to maintain the given motion

(12 Marks)

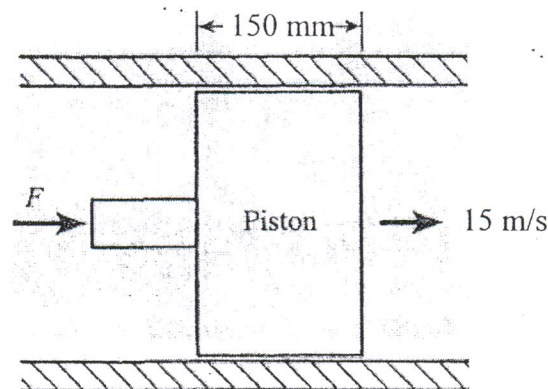


Figure 1

Question 3

- (a) For a tank containing **ethyl alcohol** under air pressure, as shown in Figure 2, find the pressure at the bottom of the tank.

(10 Marks)

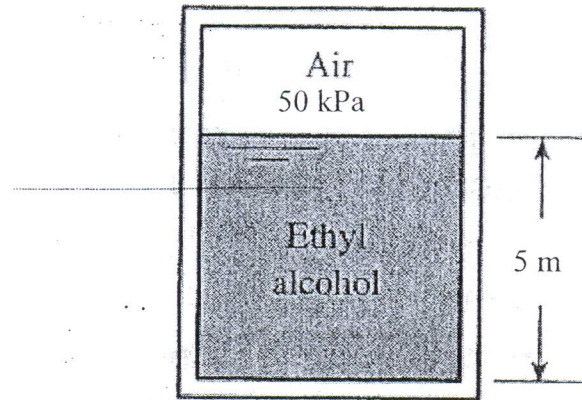


Figure 2

- (b) In the manometer of Figure 3, fluid A is water and fluid B is mercury. What is the pressure P_1 ?

(10 Marks)

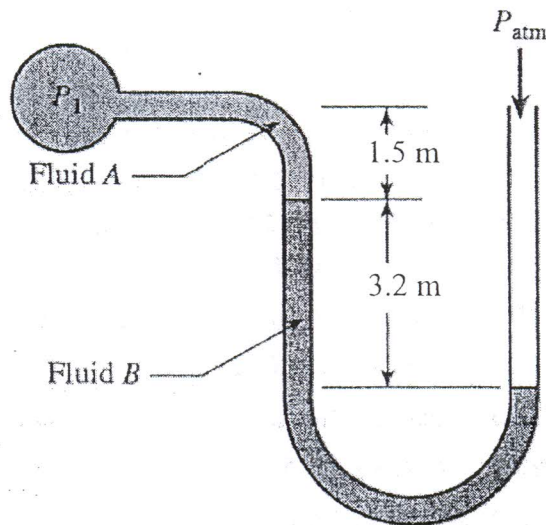


Figure 3

SECTION B (Total: 40 marks)

INSTRUCTION: Answer TWO (2) questions ONLY.

Please use the answer booklet provided.

Question 4

Determine the ;

- (i) magnitude and (10 Marks)
- (ii) point of application of the resultant force acting on the circular plate covering the opening in the water tank shown in Figure 4. (10 Marks)

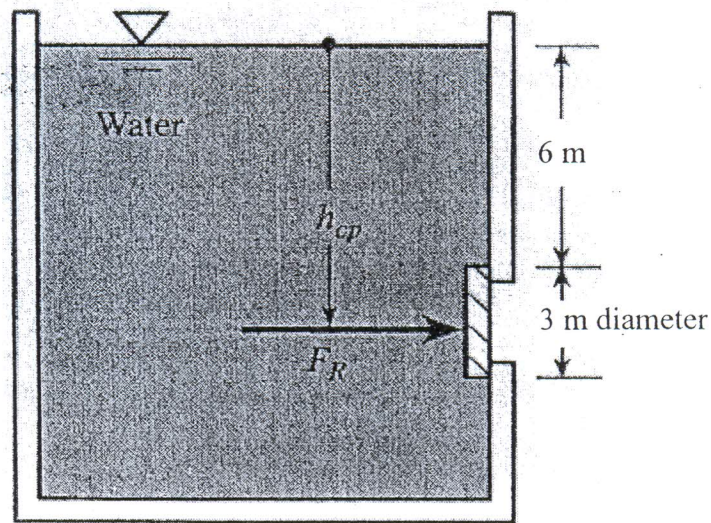


Figure 4

Question 5

A 20cm cube completely submerged in water, is balanced by a 80N weight on the beam scale, as shown in Figure 6. Determine the specific gravity of the cube material.

(20 Marks)

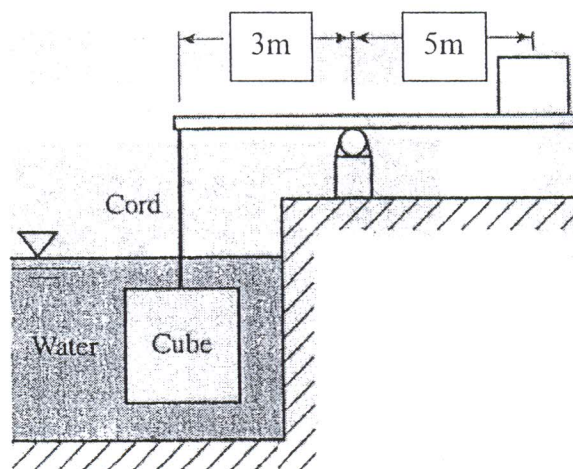


Figure 6

Question 6

For the system of Figure 7, $h = 40$ m and the diameter of the side opening is 8 cm. Find the:

- (i) Jet velocity in units of m/s

(10 Marks)

- (ii) Volume flow rate in units of liter/min

(10 Marks)

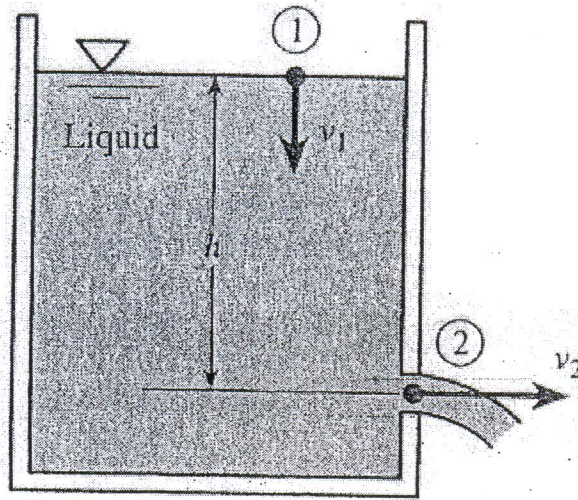


Figure 7

END OF QUESTION

Liquid	Specific Weight γ (lb/ft ³)	Density ρ (slugs/ft ³)
Carbon tetrachloride	99.1	3.08
Ethyl alcohol	49.2	1.53
Gasoline	42.2	1.31
Mercury	846	26.3
SAE 30 oil	55.5	1.72
Seawater	64.0	1.99
Water	62.4	1.94

Table 1 Specific weight and density of common liquids. (U.S. Customary units at 68°F.)

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

Gas	Specific Weight γ (lb/ft ³)	Density ρ (slugs/ft ³)
Air	0.0765	0.00238
Helium	0.0104	0.000323
Hydrogen	0.00525	0.000163
Methane	0.0415	0.00129
Nitrogen	0.0728	0.00226
Oxygen	0.0831	0.00258

Table 3 Specific weight and density of common gases. (U.S. Customary units at standard atmospheric pressure and 68°F.)

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 standard atmospheric pressure and 20°C.)