Document No : UniKL MFI_SD_AC41
Revision No: 02
Effective Date: 01 December 2008

CONFIDENTIAL

SET B

UNIVERSITI KUALA LUMPUR
Malaysia France Institute

FINAL EXAMINATION
JANUARY 2010 SESSION

SUBJECT CODE	:	FMD 20202
SUBJECT TITLE	:	FLUID MECHANICS
LEVEL	:	DIPLOMA
TIME / DURATION	:	4.00pm – 6.00pm (2 HOURS)
DATE	:	28 APRIL 2010

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 answer on the answer booklet provided.
4. Answer should be written in blue or black ink except for sketching, graphic and illustration.
5. This questions paper consists of TWO (2) sections. Sections A and B. Answer ALL questions in section A. For section B, answer TWO (2) questions only.
6. Answer all questions in English.
7. Table for specific weight and density of common liquids and gases are appended.

THERE ARE 6 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) Why can hydroplane motorboats travel at greater speeds than regular motorboats?

(4 marks)

(b) An object requires the application of 600 *lb* of force to produce an acceleration of 12 ft/s^2. Compute the mass of the body in slugs and kilograms.

(6 marks)

(c) Convert 80 °C to degree Fahrenheit, Rankine and Kelvin

(4 marks)

(d) Determine the resulting acceleration in ft/s^2 and m/s^2 if a force 100 *lb* is applied to a mass of 25 slugs.

(6 marks)

Question 2

(a) Define the term pressure?

(4 marks)

(b) Fifty gallons of hydraulic oil weighs 450 *lb*. Calculate the specific weigh in units of lb/ft^3

(4 marks)

(c) Two air tanks have initial conditions as shown in Figure 1. The valve in the interconnecting pipe is opened to allow pressures to equalize at the time the final temperature equals 30°C throughout. Find the corresponding final pressure.

(12 marks)

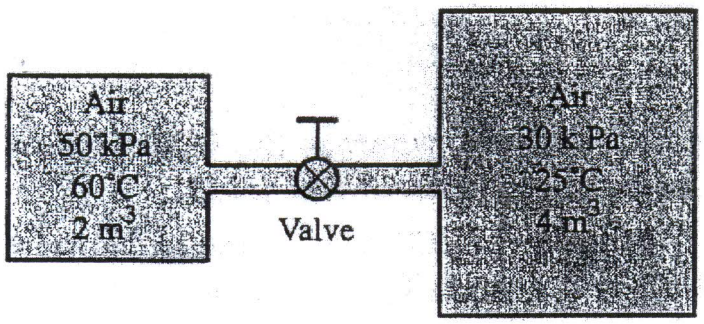

Figure 1

Question 3

(a) Convert a pressure of -8 psi to an absolute pressure

(2 marks)

(b) For the closed tank of Figure 2, the pressure gage reading is 100 psig. Find the pressure in psig at points 1, 2, 3 and 4

(10 marks)

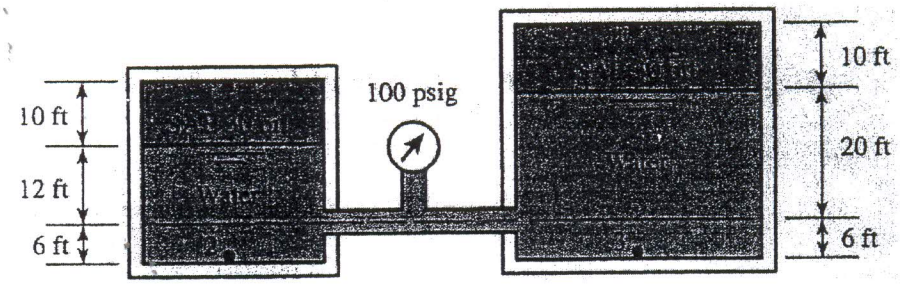

Figure 2

(c) Find the differential head *h* of mercury in units of *inches* for the Figure 3 below

(8 marks)

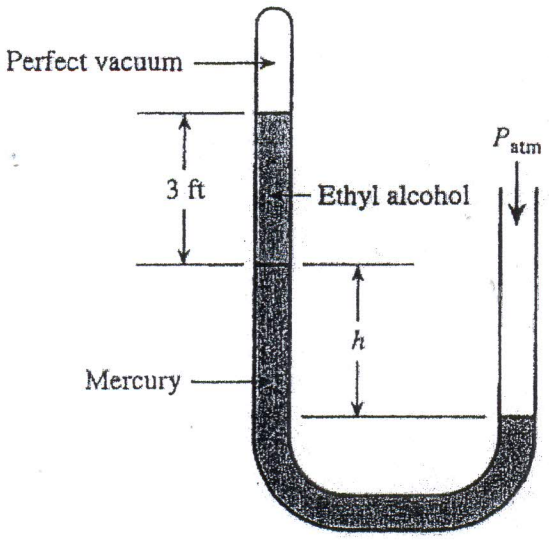

Figure 3

SECTION B (Total: 40 marks)

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

Question 4

(a) An open tank has a trapezoidal vertical cross section as shown in Figure 4. If the tank is 6 ft long and is filled with mercury, find the

(i) Weight of the mercury in the tank

(ii) Resultant force acting on the bottom tank

(10 marks)

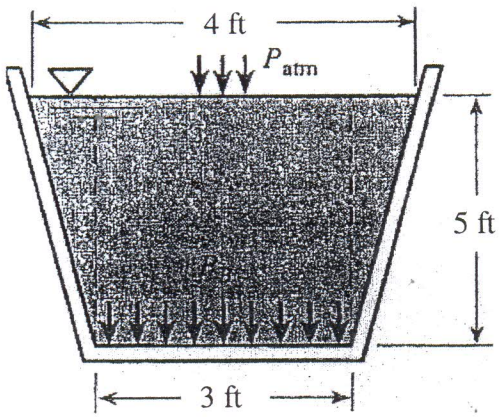

Figure 4

(b) Determine the magnitude and 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)

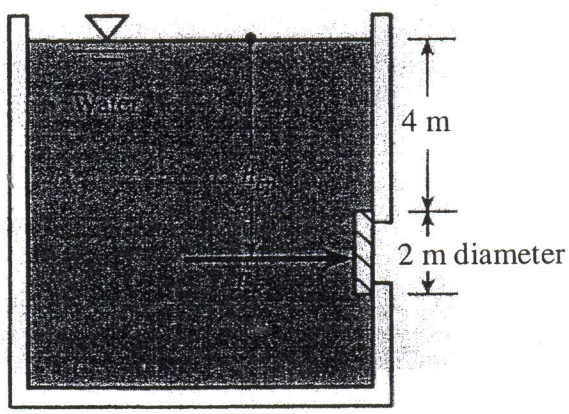

Figure 4

Question 5

(a) The measured (apparent) weight of a person is 190 *lb* where the specific weight of the atmospheric air is 0.0765 lb/ft^3. If the person's total volume is 3 ft^3, find the person actual weight and average specific weight

(8 marks)

(b) A 8 inch cube completely submerged in water, is balanced by a 15 lb weight on the beam scale, as shown in Figure 5. Determine the specific gravity of the cube material.

(12 marks)

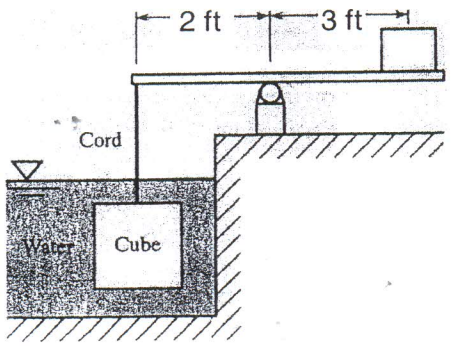

Figure 5

Question 6

(a) For the pipe of Figure 7, find the volume flow rate, fluid velocity at station 2, weight flow rate and mass flow rate if the fluid is water and $D_1 = 4$ mm and $D_2 = 2$ mm and $v_1 = 8$ m/s

(12 marks)

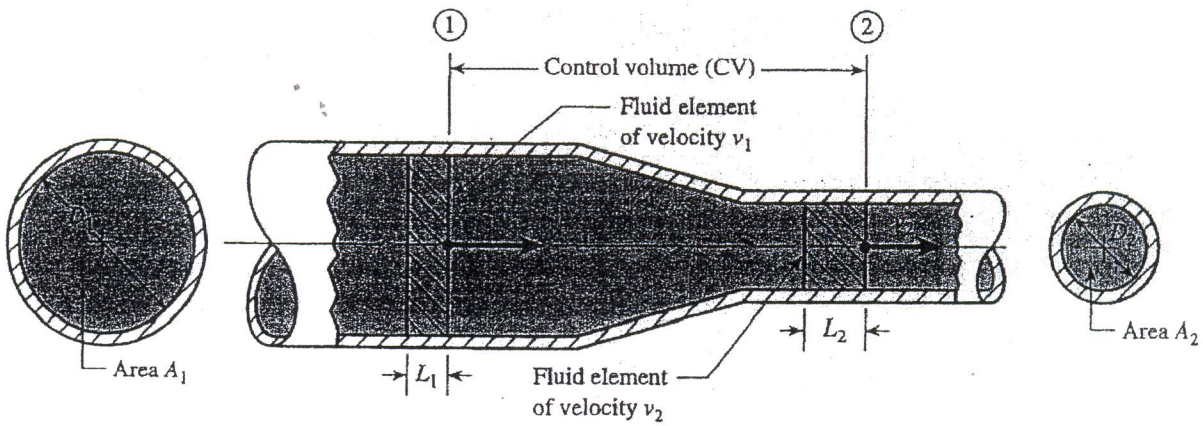

Figure 7

(b) For the pipe of Figure 8, determine the P_2 if the following data are given $P_1 = 40$ psig, $D_1 = 4$ in, $D_2 = 2$ in, and $Q = 200$ gpm

(8 marks)

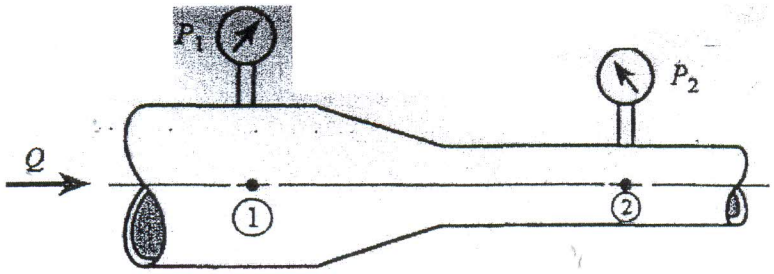

Figure 8

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.)