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CONFIDENTIAL

SET A

UNIVERSITI KUALA LUMPUR
Malaysia France Institute

FINAL EXAMINATION

JULY 2010 SESSION

SUBJECT CODE	:	FMB 30102
SUBJECT TITLE	:	FLUID MECHANICS
LEVEL	:	BACHELOR
TIME / DURATION	:	3.00pm – 5.30pm (2.5 HOURS)
DATE	:	12 NOVEMBER 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 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 FIVE (5) questions. Answer FOUR (4) questions only.
6. Answer all questions in ENGLISH.

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

INSTRUCTIONS: Answer only FOUR (4) questions.

Please use the answer booklet provided.

Question 1

(a) Briefly explain the term fluids.

(5 marks)

(b) Describe the differences between gases and liquids. Also, briefly explain on the difference in compressibility in fluids.

(8 marks)

(c) Prove whether (or not) the following equations have consistent SI units:-

i. Force = Pressure x Area

ii. Kinetic Energy = (1/2) x mass x $(velocity)^2$

iii. $(Velocity)^2$ = 2 x acceleration x distance

(12 marks)

Question 2

(a) Define and explain the following terms: - Ideal Gas Law and Bulk Modulus

(8 marks)

(b) A 500 in^3 sample of water is compressed in a cylinder until its pressure is increased from 100 to 1500 psi. If β_{WATER} = 312 kpsi, calculate the:-

i. change in the volume of the water

ii. % change in the density of the water

(9 marks)

(c) A compressed air tank has a volume of 5 m^3. If the absolute pressure is 500 kPa and the absolute temperature is 400 K, determine the weight of the air in the tank if the gas constant is given as 287 (N.m / kg. K).

(8 marks)

Question 3

(a) A manometer arrangement is shown in Figure 1. Calculate the specific gravity of the unknown fluid.

(13 marks)

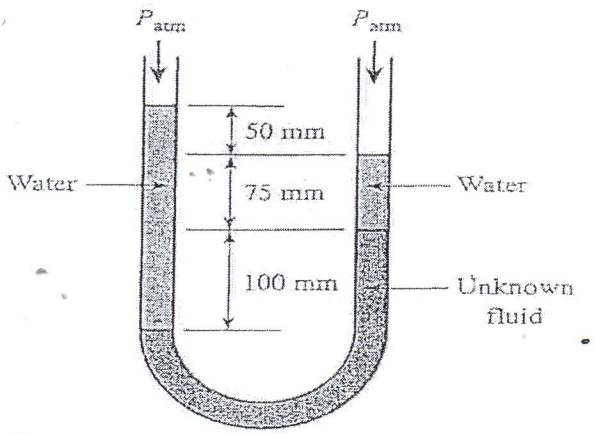

Figure 1

(b) Explain the basic features and functionality of the 'Differential Manometer'.

(12 marks)

Question 4

(a) Explain Archimedes' Principle and the concept of buoyancy. Use a suitable example.

(13 marks)

(b) Determine the gage air pressure above the water in the tank shown in Figure 2.

(12 marks)

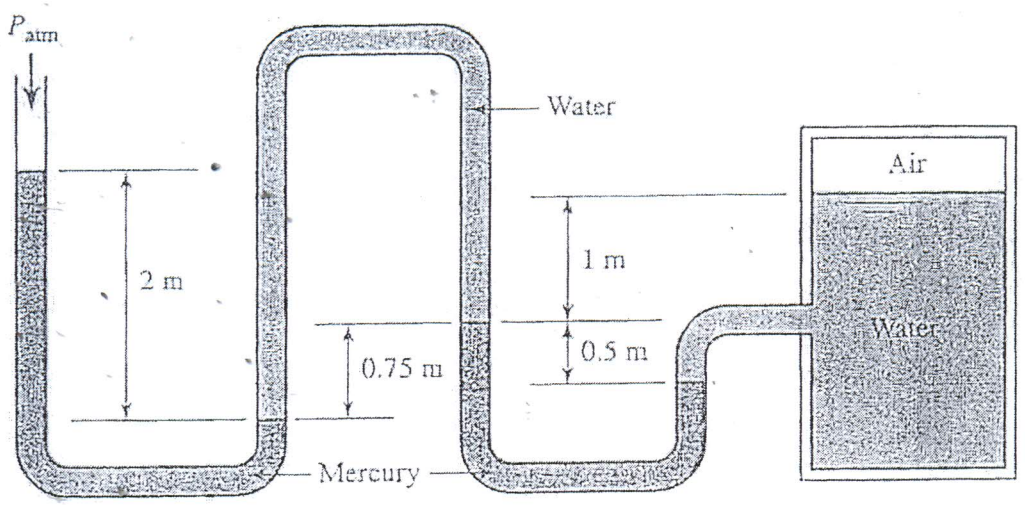

Figure 2

Question 5

(a) Define and explain Bernoulli's Equation. Use a suitable example (showing numerical calculations) in your explanation.

(13 marks)

(b) Briefly explain the Continuity Equation. Use a suitable example (showing numerical calculations) in your explanation.

(12 marks)

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.)