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CONFIDENTIAL

SET A

UNIVERSITI KUALA LUMPUR
Malaysia France Institute

FINAL EXAMINATION

SEPTEMBER 2014 SESSION

SUBJECT CODE	:	**FCB11102**
SUBJECT TITLE	:	**FLUID DYNAMICS**
LEVEL	:	**BACHELOR**
TIME / DURATION	:	**9.00 AM – 11.00 AM (2 HOURS)**
DATE	:	**5 JANUARY 2015**

INSTRUCTIONS TO CANDIDATES

1. **Answer ALL questions in English.**
2. **Please write your answers on the answer booklet provided.**
3. **Answer should be written in blue or black ink except for sketching, graphic and illustration.**
4. **Answer all questions.**
5. **Fomula and Table of Supporting Documents are Appended (RETURNABLE)**

THERE ARE 3 PAGES OF QUESTIONS, EXCLUDING THIS PAGE.

INSTRUCTION: Answer ALL questions.

Please use the answer booklet provided.

Question 1

a) List down two principles of Pascal's Law

(2 marks)

b) Describe briefly the following concepts

(i) Turbulent flow

(ii) Reynold's Number

(8 marks)

Question 2

Referring to figure Q2, the fluid flowing is CO_2 at 20°C. Neglect all losses. If pressure at point 1, P_1 = 170 kPa and the manometer fluid is oil (SG = 0.827), estimate

(Note: R_{CO2} = 0.1889 KJ/kg)

(a) density of CO_2 in kg/m^3

(5 marks)

(b) pressure at point 2, P_2 in Pascal

(5 marks)

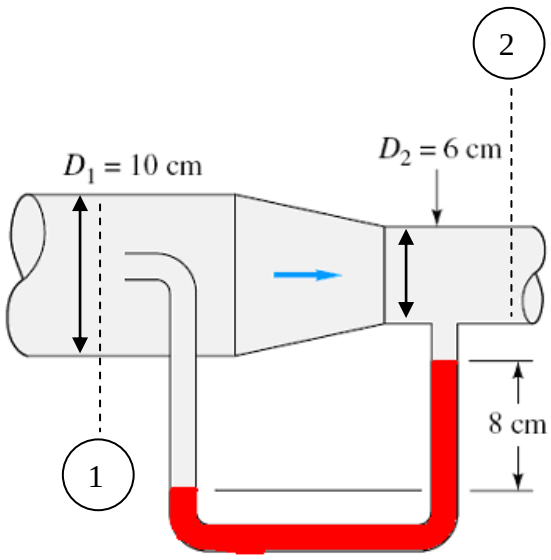

Figure Q2: Manometer

Question 3

Figure Q3 is the Model of a water cooled packaged chiller with reciprocating compressor. Condenser water supply flows at 35^{o}C through a 4" schedule 40 steel pipe to the cooling tower. The condenser water return is at 30^{o}C with flow rate of 50 L/s.

You may assume that all the elbows are standard 90^{o} elbow and all the butterfly valves are fully open, all check valves are of the ball type and the pipe entrance from the evaporator and AHU Coil is a square edge inlet type.
Given that the ΔP_{evap} is 5m and $\Delta P_{cooling\ tower}$ is 3m.

(a) Estimate the density (in kg/m^3) and dynamic viscosity (in Pa.s) of supply and return condenser water

(10 marks)

(b) Calculate the Reynolds number in the supply and return condenser water pipe

(10 marks)

(c) Calculate the friction factor and friction loss for supply condenser water pipe

(20 marks)

(d) Plot and find the friction factor and friction loss for return condenser water pipe employing Moody's Diagram

(20 marks)

(e) Calculate the Total Energy Losses and The Energy needed for the system in kW if pump efficiency is 80%

(20 marks)

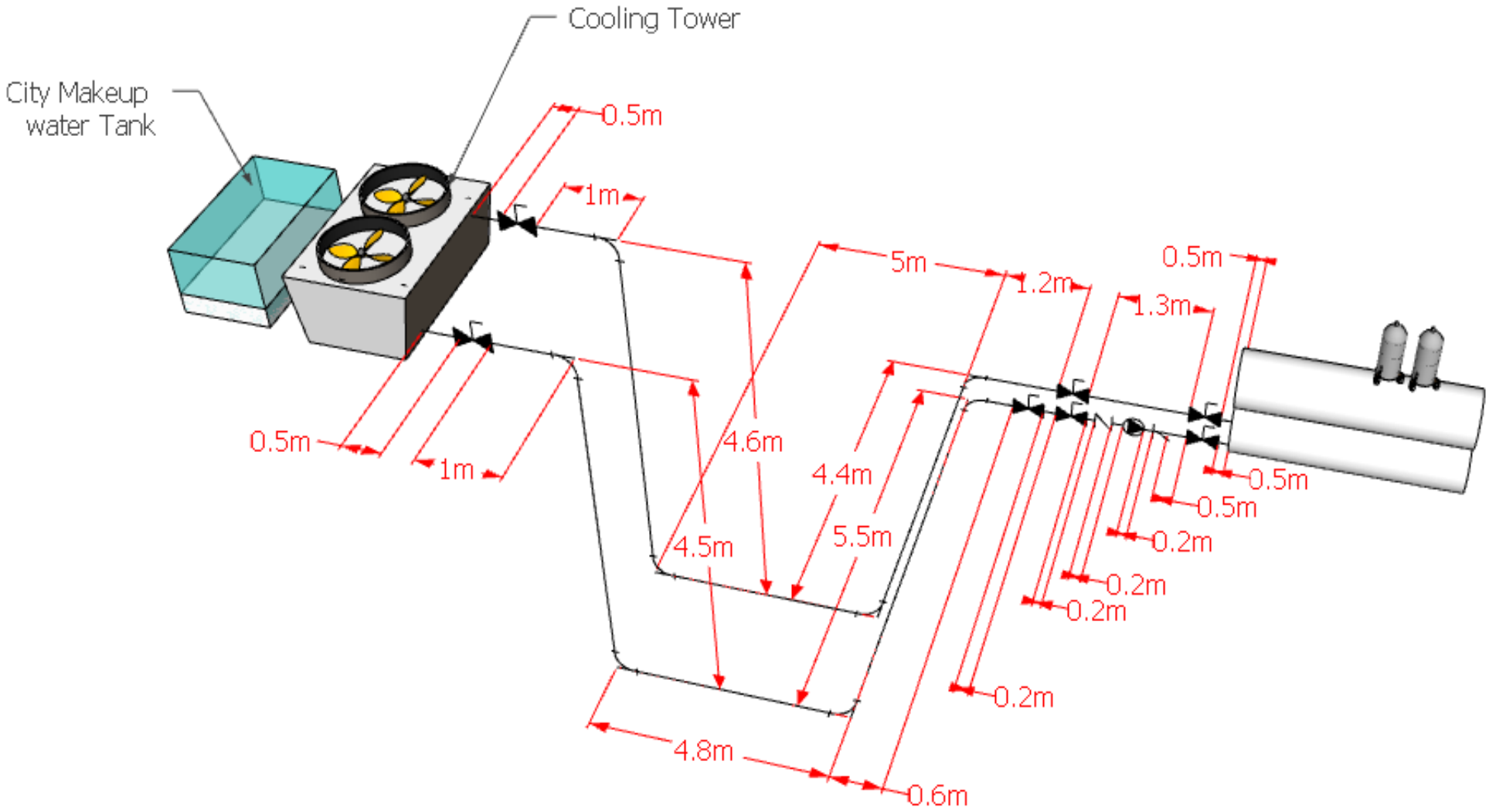

Figure Q3: Chilled Water System

END OF QUESTION