CONFIDENTIAL

SET A

UNIVERSITI KUALA LUMPUR
Malaysia France Institute

FINAL EXAMINATION

JANUARY 2014SESSION

SUBJECT CODE	:	**FCB 11102**
SUBJECT TITLE	:	**FLUID DYNAMICS**
LEVEL	:	**BACHELOR**
TIME / DURATION	:	**9.00 am - 12.00 noon** (3 HOURS)
DATE	:	30 MAY 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 for sketching, graphic and illustrations.**
5. **Answer all questions inEnglish.**
6. **Formulasheet is appended**

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

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

Question 1

(a) A storage vessel for gasoline with specific gravity0.68 is a vertical cylinder with diameter of 10 m. If it is fill to a depth of 6.75 m, determine the gasoline weight, N and mass, kg.

(2 marks)

(b) Determine the volume of mercury with specific gravity 13.6 that has same weight with 0.020 m^3 of castor oil which has specific weight 9.87 kN/m^3

(2 marks)

(c) A cylindrical container is 210 mm diameter and weighs 50 N when empty. When filled to a depth 150 mm with certain oil, its weigh 200 N. Determine

i) Density of oil, kg/m^3

(2 marks)

ii) Specific Weight of oil, kN/m^3

(2 marks)

iii) Specific Gravity of oil

(2 marks)

Question 2

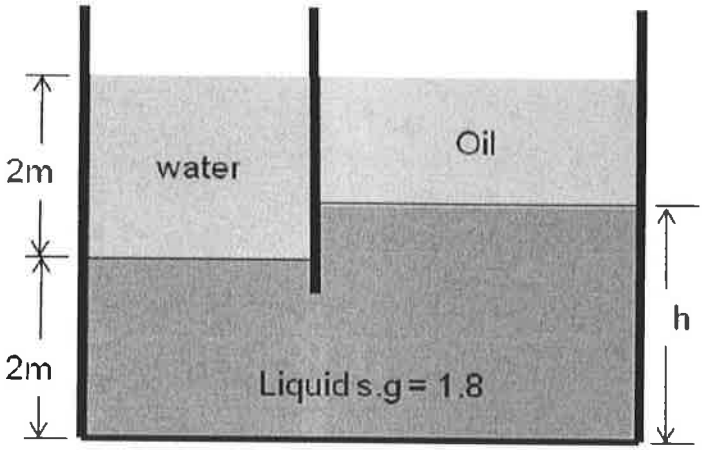


Figure Q2: Manometer Tank

Referring figure Q2 shows the tank contains water and immiscible oil at 25°C. Determine *h* in m if the specific gravity of the oil is 0.898

(10 marks)

Question 3

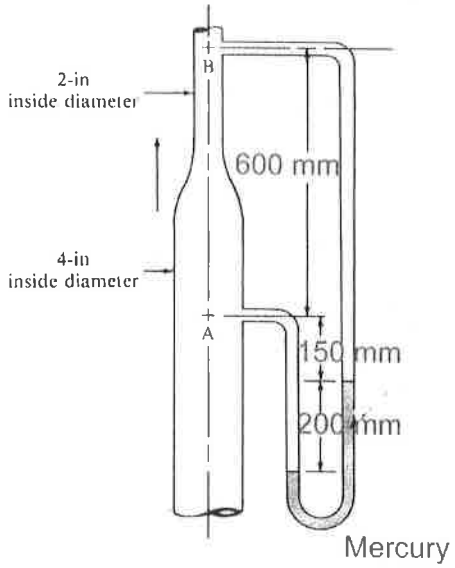


Figure Q3: Venturi Meter

Referring the venturi meter as shows in Figure Q3 carries water at 10^0C. Determine the water flow rate, m^3/min.

(20 marks)

Question 4

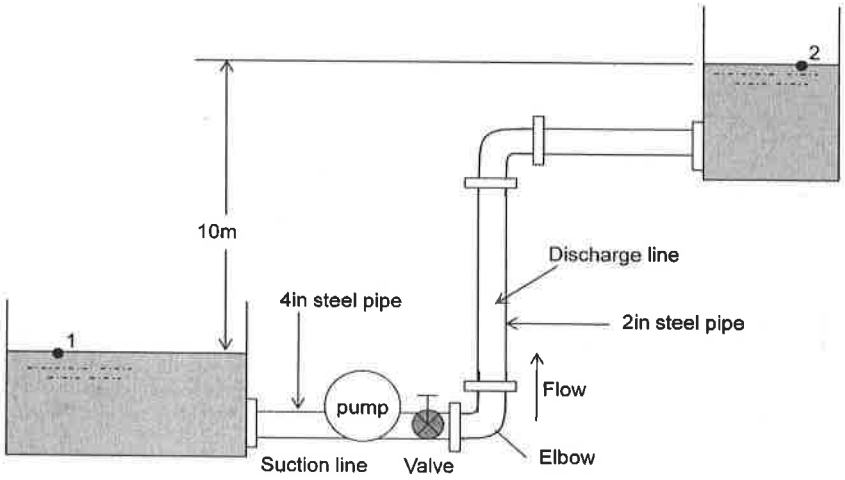


Figure Q4: Methyl Alcohol Piping System

Referring the system shows in Figure Q4 is having efficiency of 75% with Methyl alcohol at 25°C is flowing at the rate 0.015m^3/s. The suction line is standard 4-in Schedule 40 commercial steel pipe 15m long. The total length of 2-in steel Schedule-40 steel pipe in the discharge line is 20m. Assume that the entrance from the reservoir 1 is through a square edge inlet and the elbows are standard and the gate valve is fully open.

(a) Total loss in suction and discharge pipe, m

(16 marks)

(b) Pump Power supplied to the system, kW

(4 marks)

Question 5

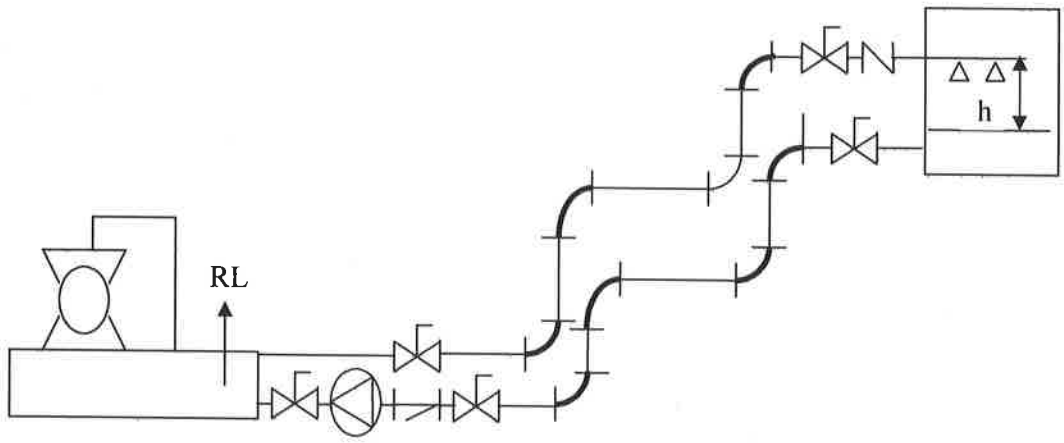


Figure Q5: Condenser Cooling Water System

Referring Figure Q5 shows the model of a water cooled packaged chiller with reciprocating compressor. Return condenser water flows at 35 °C through a 4" schedule 40 steel pipe with total length 150 m to the cooling tower. The condenser water is supply from the cooling tower at 30 °C with flow rate of 40 L/s through a 4" schedule 40 steel pipe with total length 120 m. Assume that all the elbows are standard and all the butterfly valves are fully open, all check valves are a ball type and the pipe entrance from the condenser and basin of cooling tower is a square edge inlet type.

(a) Find the density, m^3/kg and dynamic viscosity, pa.s for supply and return condenser water

(4 marks)

(b) Reynolds number for supply and return condenser water pipe

(4 marks)

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

(12 marks)

(d) Plot and find the friction factor and friction loss for return chilled water pipe by Moody's Diagram in the appendix.***(Submit Moody's Diagram with the answer booklet)***

(8 marks)

(e) The total energy losses in the system, m

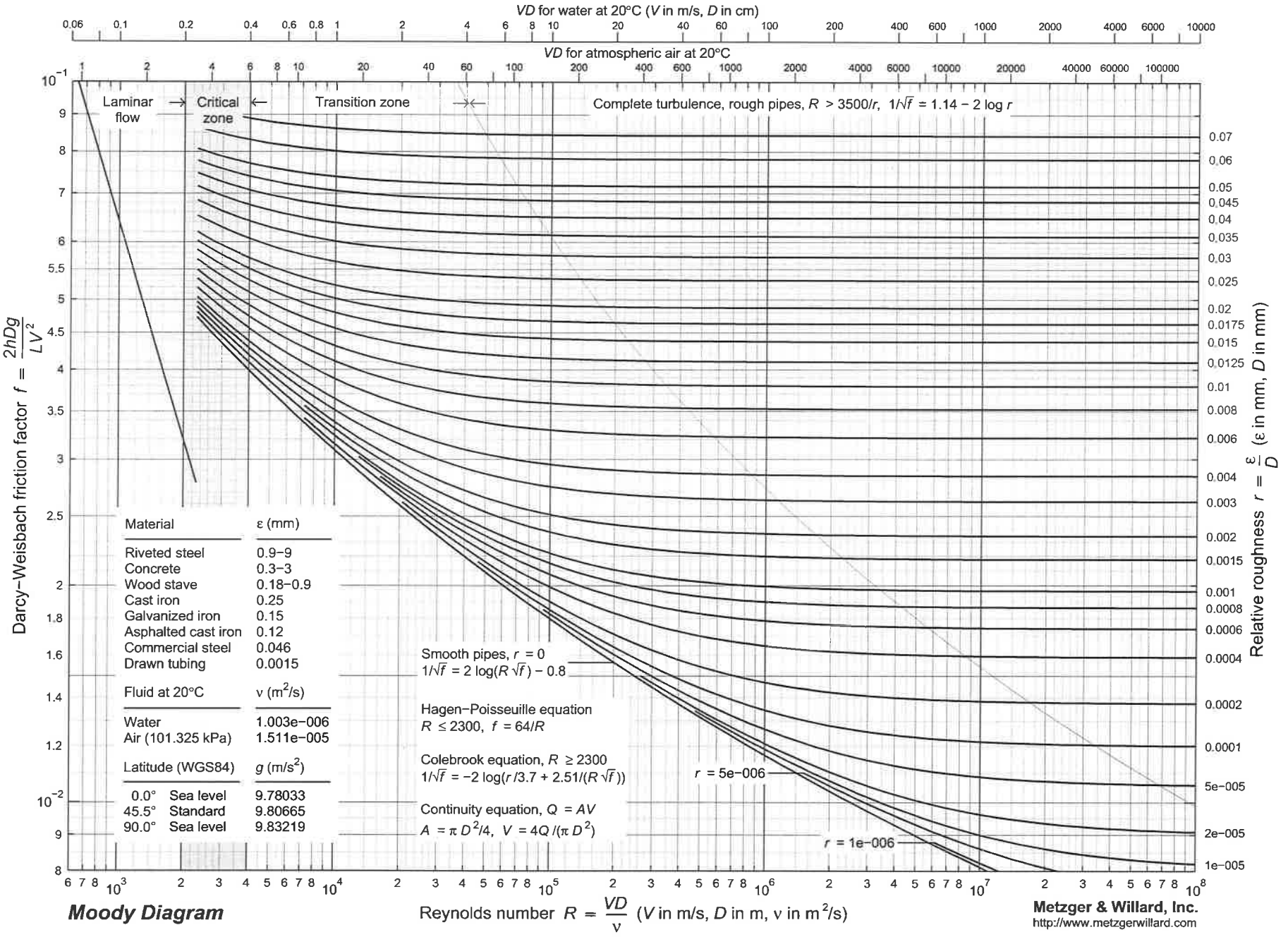
(8 marks)

(f) Calculate the pump power supply in kW if the pump efficiency is 70%

(4 marks)

END OF QUESTION

APPENDIX


VD for water at 20°C (V in m/s, D in cm)
VD for atmospheric air at 20°C
Laminar flow
Critical zone
Transition zone
Complete turbulence, rough pipes, R > 3500/r, 1/√f = 1.14 − 2 log r
Darcy–Weisbach friction factor f = 2hDg/LV²
Relative roughness r = ε/D (ε in mm, D in mm)
Material | ε (mm)
Riveted steel 0.9–9
Concrete 0.3–3
Wood stave 0.18–0.9
Cast iron 0.25
Galvanized iron 0.15
Asphalted cast iron 0.12
Commercial steel 0.046
Drawn tubing 0.0015
Fluid at 20°C | ν (m²/s)
Water 1.003e−006
Air (101.325 kPa) 1.511e−005
Latitude (WGS84) | g (m/s²)
0.0° Sea level 9.78033
45.5° Standard 9.80665
90.0° Sea level 9.83219
Smooth pipes, r = 0
1/√f = 2 log(R √f) − 0.8
Hagen–Poisseuille equation
R ≤ 2300, f = 64/R
Colebrook equation, R ≥ 2300
1/√f = −2 log(r/3.7 + 2.51/(R √f))
Continuity equation, Q = AV
A = π D²/4, V = 4Q/(π D²)
r = 5e−006
r = 1e−006
Moody Diagram
Reynolds number R = VD/ν (V in m/s, D in m, ν in m²/s)
Metzger & Willard, Inc.
http://www.metzgerwillard.com