UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER I
SESSION 2009/2010

SUBJECT NAME	:	FLUID MECHANICS
SUBJECT CODE	:	BFC 1043
COURSE	:	1 BFC
EXAMINATION DATE	:	NOVEMBER 2009
DURATION	:	3 HOURS
TASK	:	ANSWER **FIVE (5)** QUESTIONS FROM **SIX (6)** QUESTIONS

THIS PAPER CONSIST OF 8 PRINTED PAGES

Q1. (a) Explain why the pressure in fluid increases with depth?

(3 marks)

(b) Calculate the pressure difference in double – fluid manometer as shown in Figure.

Q1(b). Express your answer in P_B-P_A.

(7 marks)

(c) A circular gate was used to store an oil (s.g. 0.85) as shown in Figure **Q1 (c),**

i. compute the magnitude of the resultant force
ii. locate the location of the center of pressure.
iii. Show the resultant force on the area and clearly dimension its location.

(10 marks)

Q2 (a) Define briefly metacentric height , GM.

(2 marks)

(b) Sketch a free body diagrams of forces for stable and unstable condition of
i. a submerged body
ii. floating body (consider the moment)

(8 marks)

(c) A platform as shown in Figure **Q3(c)** is being designed to support some water pollution testing equipment. Its base is 0.9 m wide, 1.2 m long, and 0.3 m high. The entire system weighs 579 N, and its center of gravity is 0.86 m above the top surface of the platform. With the aid of sketches, is the proposed system stable when floating in seawater ($\rho = 1025$ kg/m^3) ?

(10 marks)

Q3 (a) With the aid of sketches, differentiate between ideal and real flow.

(6 marks)

(b) Water flows in an elbow was aligned horizontally at an of angle 135 ^{0} as shown in Figure **Q3(b).** If the volume of water in section 1 and 2 is 0.2 m^3 respectively , the elbow weighs 12 kg and the flowrate 0.4 m^3/s. Calculate
i. resulatant force
ii. the direction of the resultant force

(14 marks)

Q4 (a) With the aid of sketches, state **four (4)** conditions which contributed to the minor losses.

(4 marks)

(b) Determine the energy loss for a gradual contraction from a 4-in pipe to a 1 1/2-in pipe for a flow rate of 250 gall/min by using the information from Figure **Q4(b).** The cone angle for the contraction is 76°. (1 gall = 3.7854 litre, 1in = 25.5mm)

(6 marks)

(c) On a farm, water at 15°C is delivered from a pressurized storage tank to an animal watering trough through 91.44 m of 1 1/2-in steel pipe ($e = 4.5 \times 10^{-5}$ m) as shown in Figure **Q4(c).** If kinematics viscosity and density of water at 15°C are 1.14×10^{-6} m^2/s and 999 kg/m^3 respectively, calculate the required air pressure above the water in the tank to produce 283.875 L/min of flow.

(10 marks)

Q5 (a) A steel pipe (e = 0.065 mm) 4200 m long is to convey oil ($\nu = 5.2 \times 10^{-5}$ m^2/s) at 300 L/s from a reservoir with surface elevation 247 m to one with surface elevation 156 m. Determine the pipe diameter.

(10 marks)

(b) Water at 15^0C flowing through 25 m of 100 mm diameter galvanized iron (e = 0.15 mm) pipe causes a friction head loss of 75 mm. Calculate the flowrate.

(10 marks)

Q6 (a) Briefly explain geometric similarity and state **three(3)** advantages using similarity.

(8 marks)

(b) A pipeline 300 m long discharges freely at a point 50 m lower than the water surface of a reservoir as shown in Figure **Q6(b)**. The first 200 m is of 350 mm diameter and the ramaining 100 m is of 250 mm diameter. Given coeficient for sudden contraction and reentrant entrance are 0.21 and 0.8 respectively. By assuming f = 0.06, calculate the flowrate.

(12 marks)

Appendix I

FINAL EXAM

SEMESTER/SESSION	: SEMESTER I/2009/2010	COURSE	: 1BFC
SUBJECT	: FLUID MECHANICS	CODE SUBJECT	: BFC1043

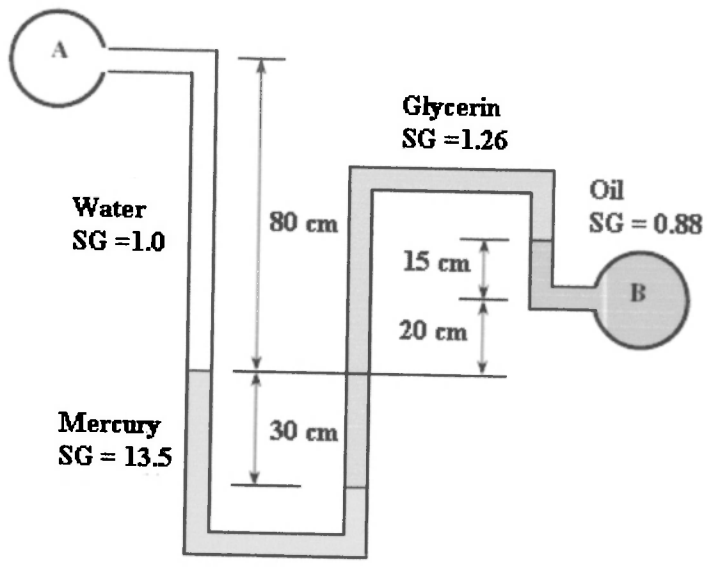

Figure Q1(b)

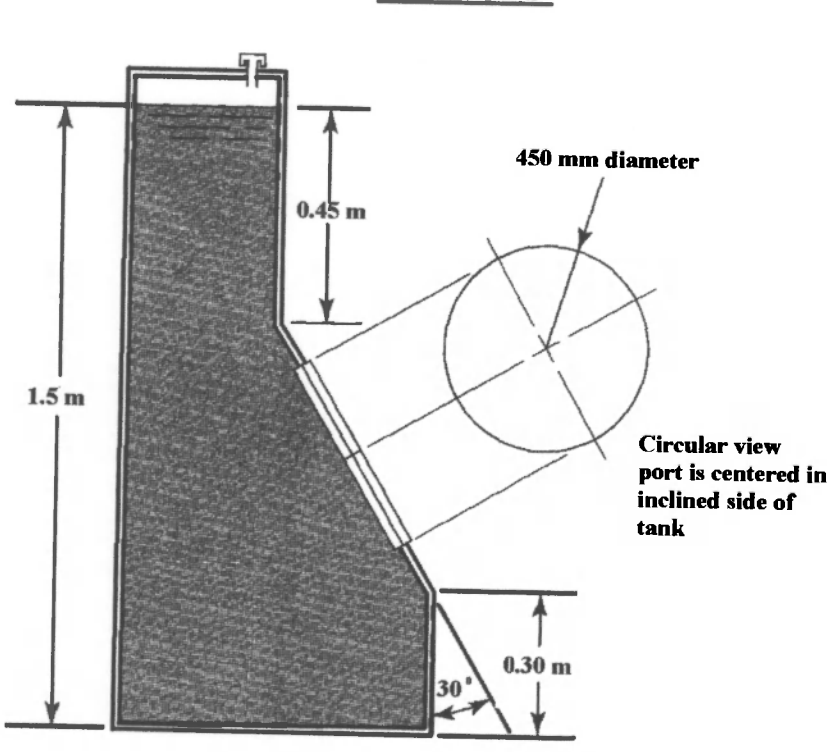

Figure Q1(c)

Appendix 2

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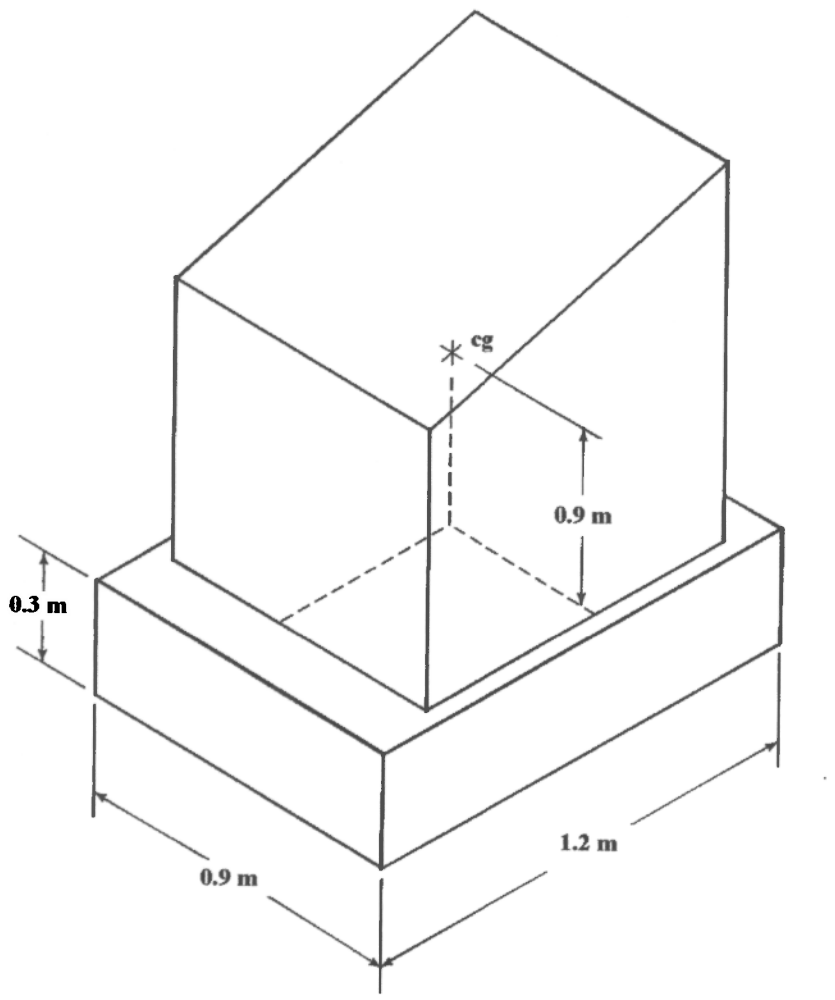

Figure O2(c)

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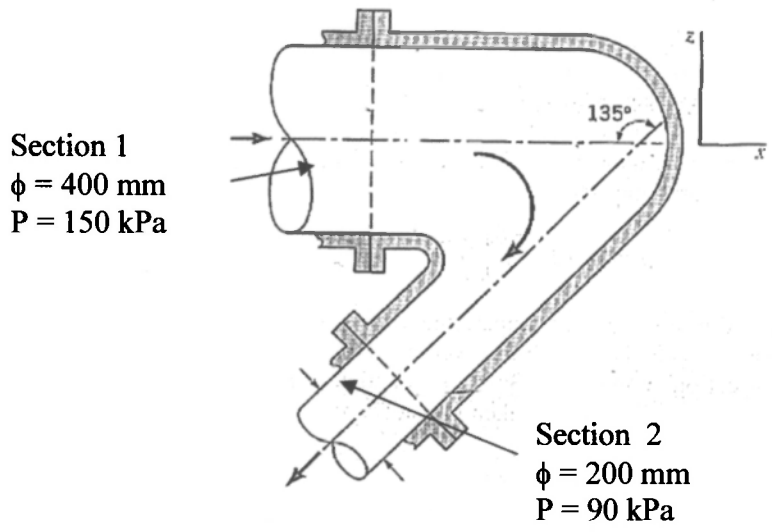

Figure Q3(b)

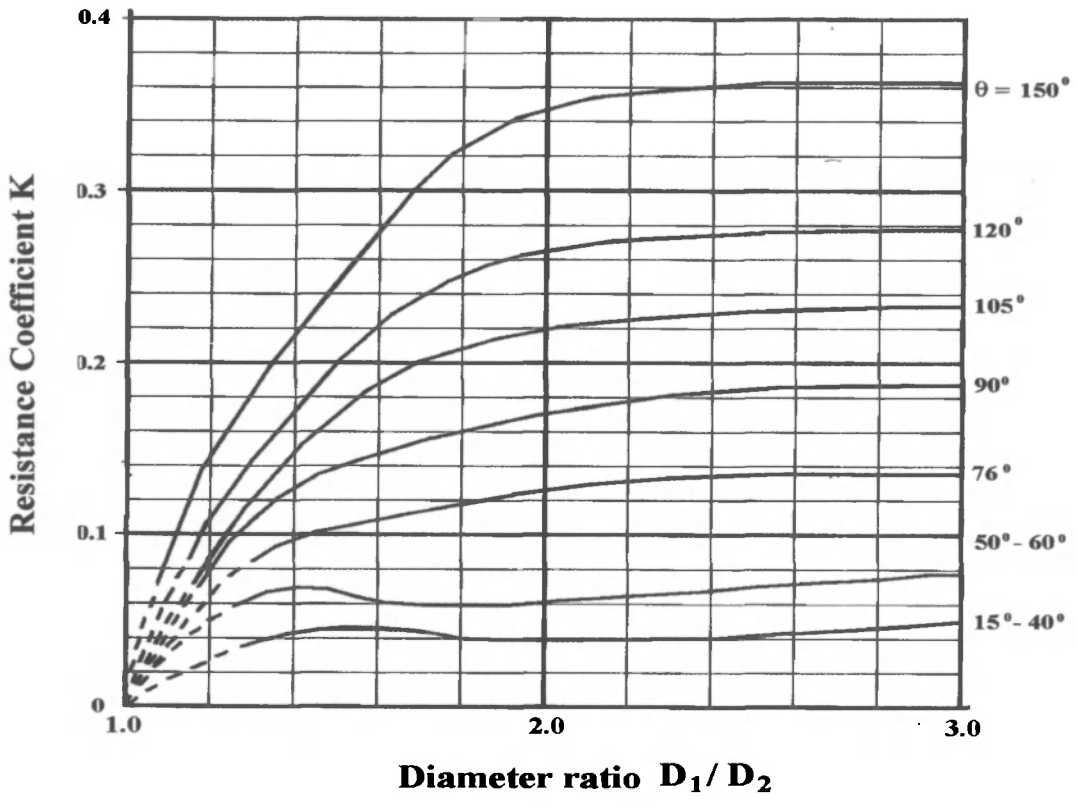

Figure Q4(b

Appendix 4

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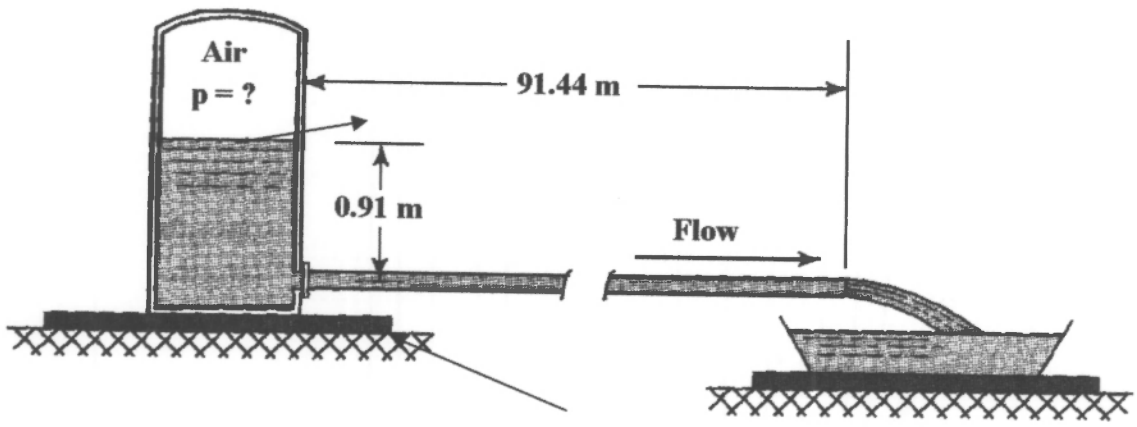

Figure O4(c)

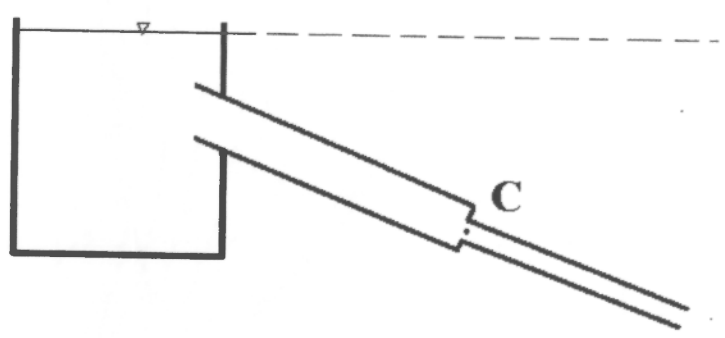

Figure O6(b)