UNIVERSITY OF JOHANNESBURG

PROGRAM	:	NATIONAL DIPLOMA *ENGINEERING: MECHANICAL*
SUBJECT	:	**FLUID MECHANICS II**
CODE	:	**IMF2111**
DATE	:	SUMMER EXAMINATION 2017 25 NOVEMBER 2017
DURATION	:	(SESSION 2) 12:30 - 15:30
WEIGHT	:	40: 60
TOTAL MARKS	:	100

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MODERATOR : P. SIMELANE

NUMBER OF PAGES : 5 PAGES (Including cover page)

INSTRUCTIONS :

1. PLEASE ANSWER ALL QUESTIONS NEATLY;
2. SHOW ALL CALCULATIONS;
2. ANSWERS WITHOUT UNITS WILL BE PENALIZED;
3. NUMBER YOUR ANSWERS STRICTLY ACCORDING TO THE QUESTIONS;
5. TAKE GRAVITATIONAL ACCELERATION (g) as 9,81 m/s^2.

Question 1

1.1 Define specific gravity and discuss its relationship to density; (4)

1.2 What is the difference between an internal and an external flows (3)

1.3 Consider two identical 5kg glass balls dropped into two identical containers, one filled with water and the other one with oil. State which ball will reach the bottom of thr containers first and why (2)

1.4 How does the dynamic viscosity of (a) liquids and (b) gases vary with temperature? (4)

1.5 Discuss and define relative density according to the formula and SI units where applicable. (2)

[15]

Question 2

A gasoline line is connected to a pressure gauge through a double-U-tube manometer, as shown in figure 2 below. If the reading of the pressure gage is 370 kPa, redraw the diagram and use it to determine the gage pressure of the gasoline line. The effect of air column on pressure can be ignored.

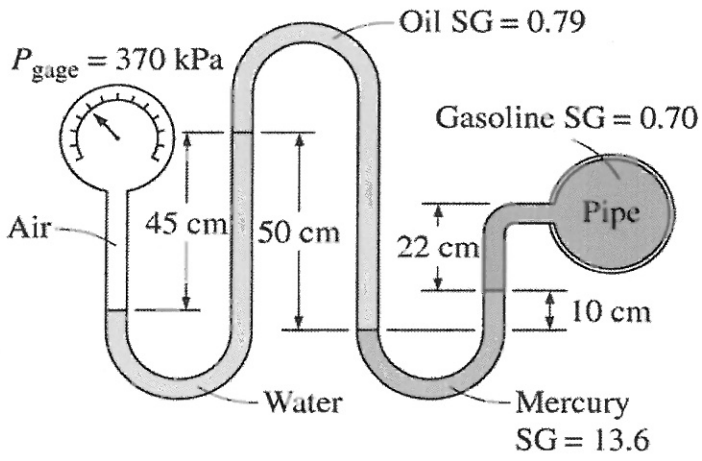

Figure 2

[7]

Question 3

A hydraulic jack has a ram of 90 mm in diameter and a plunger of 15 mm in diameter. The stroke of the plunger is 25 mm and the effort required to lift a mass of 1000 kg is 15 N. Redraw the diagram and use it to calculate:

3.1 The fulcrum advantage of the hydraulic jack; (10)

3.2 The number of strokes required to lift the load by 50 mm. (5)

[15]

QUESTION 4

Consider Figure 4 below, Redraw the diagram and use it to find the force P required to hold the gate in position. The gate is hinged as shown and it is 5 m wide.

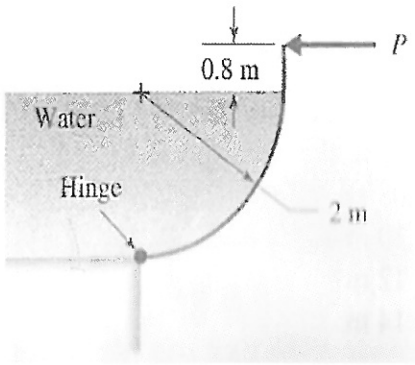

Figure 4

[13]

QUESTION 5

A rectangular pontoon 10 m by 4 m in plan, weighs 280 kN and floats in sea water of density 1025 kg/m^3. A steel tube weighing 34 kN is placed longitudinally on the deck. When the tube is in a central position, the centre of gravity for the combined mass is on the vertical axis of symmetry 0,25 m above the water surface. Draw the relevant diagram and find:

5.1 the metacentric height, and (13)

5.2 the maximum distance the tube may be rolled laterally across the deck if the angle of heel is not to exceed 5°. (7)

[20]

QUESTION 6

Water is flowing through a pipe shown in Figure 6 below. The pipe has diameter of 300 mm and 150 mm at section 1 and 2 respectively. The rate of flow through the pipe is 38 liters/second. Section 1 is 4 m above the datum and section 2 is 2 m above datum. Redraw the diagram and calculate the pressure at section 2 if the pressure at section 1 is 40 kPa.

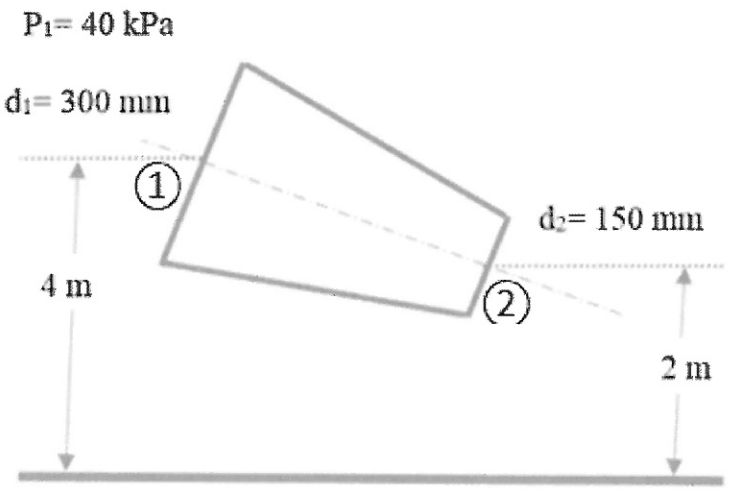

Figure 6

[14]

QUESTION 7

Water flows through a pipe AB which is 1m in diameter at 2.8 m/s and then passes through a pipe BC that is 1.3 m in diameter. The pipe forks at C. Branch CD is 0.65 m in diameter and carries one-third of the flow in AB. The velocity in branch CE is 2 m/s. Draw the appropriate sketch and calculate:

7.1 The volume rate of flow in AB; (4)

7.2 The velocities in BC and CD and the diameter of CE. (5)

[9]

QUESTION 8

A Venturi meter equipped with a differential pressure gauge is used to measure the flow rate of water through a 5 cm diameter horizontal pipe as shown below. The diameter of the Venturi neck is 3 cm, and the measured pressure drop is 5 kPa. Taking the discharge coefficient to be 0.98, determine:

8.1 The volume flow rate of water; (4)

8.2 The average velocity through the pipe. (3)

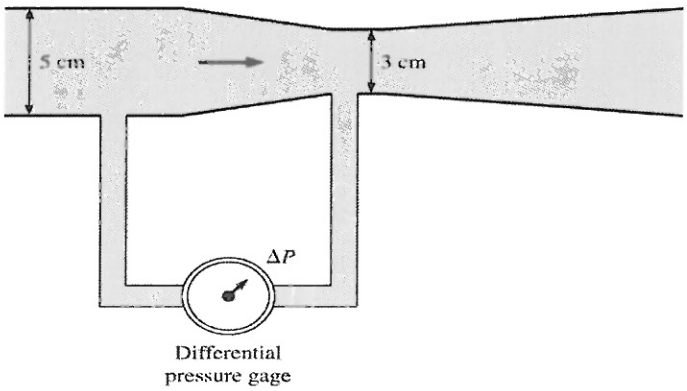

Figure 6 [7]
