Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER I
SESSION 2016/2017

COURSE NAME	:	FLUID MECHANICS AND HYDRAULICS
COURSE CODE	:	DAB 20103
PROGRAMME CODE	:	DAB
EXAMINATION DATE	:	DECEMBER 2016 / JANUARY 2017
DURATION	:	3 HOURS
INSTRUCTION	:	ANSWER **FIVE (5)** QUESTIONS ONLY

THIS QUESTION PAPER CONSISTS OF **SIX (6)** PAGES

Q1 (a) Explain about surface tension.

(4 marks)

(b) Compare the characteristics between wetting fluid and nonwetting fluid.

(4 marks)

(c) A liquid compressed in a cylinder has a volume of 2 m^3 at 2 MN/m^2 and a volume reduce about 15 % at 4 MN/m^2. Determine bulk modulus of elasticity.

(5 marks)

(d) Compute the capillary rise in the tube for a mercury-air-glass interface with 140 ^{o} if the tube diameter is 0.3 cm and surface tension force is 0.5 N/m. ($\rho_{mercury}$ = 13500 kg/m^3).

(7 marks)

Q2 (a) Describe about simple U-tube manometer as a pressure measurement device.

(4 marks)

(b) Compare specifications between bourdon gauge and transducer.

(4 marks)

(c) Refer **Figure Q2(c)**, analyze pressure at A in kN/m^2 if h_1 = 100 cm, h_2 = 240 cm and $\rho_{mercury}$ = 13500 kg/m^3.

(12 marks)

Q3 (a) Explain about bouyancy concept in Archimedes principle.

(4 marks)

(b) Sketch diagrams according to the situations as below:

i) Distance of gravity center greater than buoyancy center

(2 marks)

ii) Distance of buoyancy center greater than gravity center

(2 marks)

(c) A 13000 kg barrel with 4 m diameter and 6 m height was put inside a tank that consists raw water was stabilized and found floating inside the water tank. Determine as below:

i) Volume of water displaced

(4 marks)

ii) Depth of barrel inside the water tank

(4 marks)

iii) Distance from center of gravity to center of buoyancy

(4 marks)

Q4 (a) List **four (4)** assumptions for a fluid according to Bernoulli's equation.

(4 marks)

(b) Explain the application of pitot tube in Bernoulli Theorem.

(4 marks)

(c) Calculate the water velocity that entered the a closed tank from a reservoir. The pressure inside the tank is -160 kN/m^2 and water level inside the reservoir is 10 m higher from the tank. Ignore the friction loss.

(4 marks)

(d) Diameter of a pipe at point A change uniformly from 8 cm at 4 m datum level to 4 cm at 2 m datum level at point B. The pressure and velocity at A are 55 kN/m^2 and 2 m/s. Ignoring losses, analyze pressure at B.

(8 marks)

Q5 (a) Explain briefly about minor losses in pipe.

(5 marks)

(b) Sketch **three (3)** situations of head entrance loss.

(3 marks)

(c) Refer **Table Q5(c)** and **Figure Q5(c)**, determine the head loss due to friction when an oil flowing through a galvanized iron pipe at a velocity of 300 cm/s. The pipe is 600 m long and has a diameter of 60 cm. ($\upsilon = 1.31 \times 10^{-6}$ m^2/s).

(6 marks)

(d) Refer **Table Q5(d),** analyze the flow rate of oil in the cast iron pipe. Energy head loss is 2500 mm is occurred in 5 cm diameter and 600 cm length.

(6 marks)

Q6 (a) Define the meaning of pipes in series.

(2 marks)

(b) Explain **three (3)** important principles that applicable in solving pipes in parallel problems.

(6 marks)

(c) Determine the absolute viscosity of the medium lubricating oil is pumped through 300 m of horizontal 50 mm pipe at the rate of 0.00114 m^3/s and the drop in pressure is 200 kPa. (specific gravity: 0.86).

(6 marks)

(d) Evaluate the head lost in pipe for an oil flows through 3000 m of 300 mm cast iron pipe at the rate of 0.0444 m^3/s. Oil of absolute viscosity is 0.101 $N.s/m^2$ and specific gravity is 0.85.

(6 marks)

-END OF QUESTIONS-

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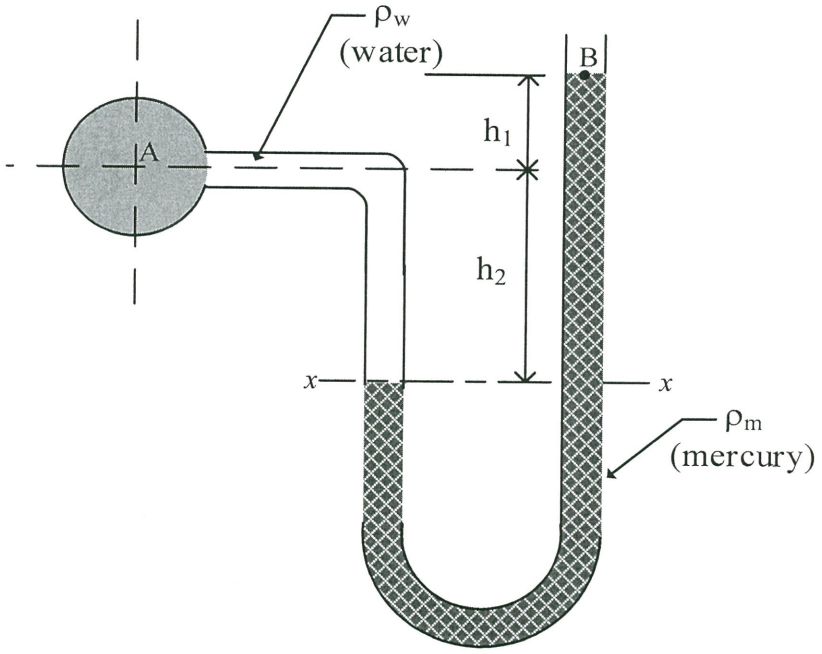

Figure Q2(c)

Table Q5(c)

Material	Absolute Roughness, e (mm)
Glass	0.0
Concrete	3
Galvanized Iron	0.15

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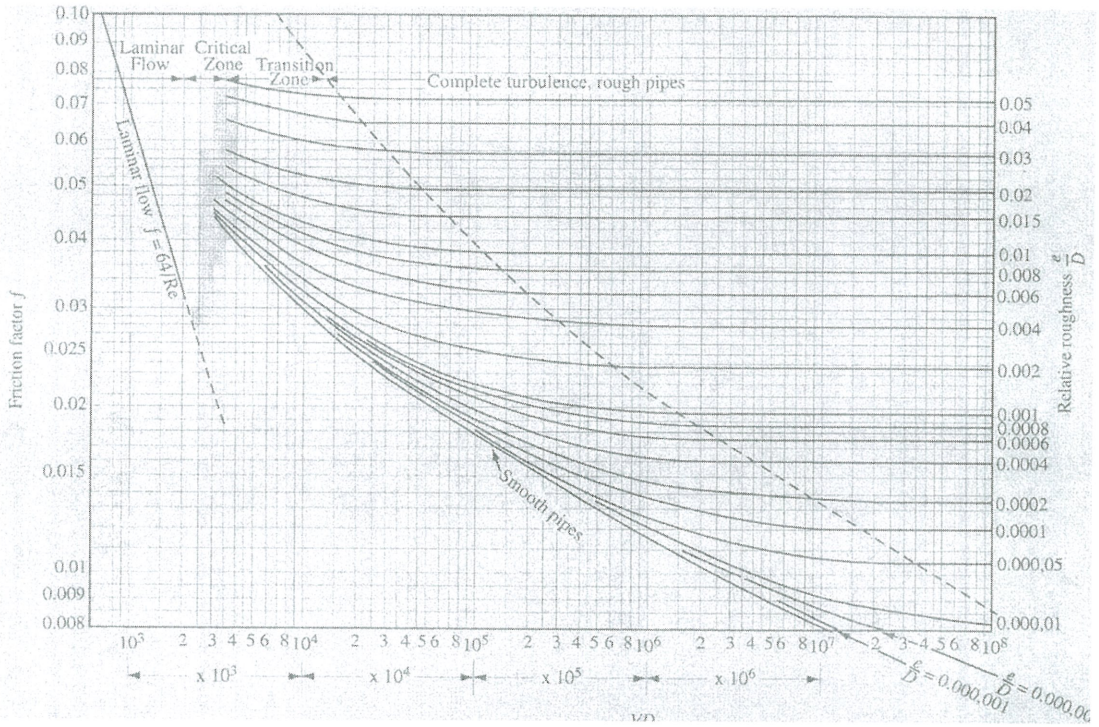

Figure Q5(c)

Table Q5(d)

Item	Value
$f_{cast\ iron}$	0.035
Kinematic viscosity, υ	5×10^{-4} m^2/s
Roughness of cast iron pipe, e	0.25 mm