Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER II
SESSION 2015/2016

COURSE NAME	:	FLUID MECHANICS
COURSE CODE	:	BNP 10303
PROGRAMME CODE	:	BNB/BNA/BNC
EXAMINATION DATE	:	JUNE 2016
DURATION	:	3 HOURS
INSTRUCTION	:	ANSWER **ALL** QUESTIONS

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

Q1 (a) Define the specific gravity and describe its relation to density.

(5 marks)

(b) Consider two small glass balls are simultaneously dropped into two containers; one filled with water and the other with raw oil. Volume and shape of both containers are similar. Identify which of the ball will touch the bottom of the container first. Please explain your answer.

(5 marks)

(c) When a 1.4 mm diameter tube is inserted into a liquid which the density is 960 kg/m^3, the liquid rises for 6 mm in tube and making a contact angle of 30^o. Determine the surface tension of the liquid.

(5 marks)

(d) The value of bulk modulus of elasticity is 2 x 10^9 Pa, determine the required pressure increase to reduce the volume of water by 2%.

(5 marks)

(e) Determine the atmospheric pressure at a location where the barometric reading is 740 mm Hg and the gravitational acceleration is g = 9.81 m/s^2. Assume the temperature of mercury to be 10^{o}C, at which its density is 13, 570 kg/m^3.

(5 marks)

Q2 (a) List **FOUR (4)** of the limitations on the use of Bernoulli Equation.

(4 marks)

(b) Water enters a nozzle steadily at 50 m/s and leaves at 150 m/s. If the inlet area of nozzle is 80 cm^2, determine:

(8 marks)

(c) Water flows in an 135^0 elbow was aligned horizontally as shown in **Figure Q2 (c)**. If the mass flow rate in section 1 and 2 is 212 kg/sec and the flowrate 0.4 m^3/s, analyze :

(i) Resultant force

(ii) The direction of the resultant force

(13 marks)

Q3 (a) Define the Reynolds Number. Explain briefly the physical significance at large Reynolds Number.

(4 marks)

(b) Oil flows in a pipe 80 mm bore with a mean velocity of 4 m/s. The mean surface roughness is 0.02 mm and length is 60 m. The dynamic viscosity is 0.005 N s/m^2 and the density is 900 kg/m^3. Determine the pressure loss.

(8 marks)

(c) Water flows at 300 l/s through a rough pipe with 10 cm diameter, 350 m length as shown in **Figure Q3 (c)** and friction factor by using Karman Equation, determine:

(i) Type of flow if pipe roughness is 0.012 cm and kinematics viscosity, $\upsilon = 8.85 \times 10^{-6}$ m^2/s.

(ii) Pressure at A

(13 marks)

Q4 (a) Define Enegy Grade Line (EGL) and Hydraulic Grade Line (HGL). Give the difference between EGL and HGL

(5 marks)

(b) Two pipes connect two reservoirs (A and B) as shown in **Figure 4(b)** , which have a height difference of 10m. Pipe 1 has diameter 50 mm and length 100 m. Pipe 2 has diameter 100 mm and length 100 m. Both have entry loss $k_L = 0.5$ and exit loss $k_L = 1.0$ and Darcy $f = 0.008$. Compose of flow for each pipe.

(10 marks)

(c) Analyze the difference level between 2 reservoirs, which is connected by single pipe of cast iron for 1 km as shown in **Figure 4(c).** Discharge and diameter is given as 0.01 m^3/s and 5 cm respectively ($v = 1.14 \times 10^{-6}$ m^2/s).

(10 marks)

- END OF QUESTION -

FINAL EXAMINATION

SEMESTER/SESSION: SEM II/2015/2016 PROGRAMME CODE : BNA/BNB/BNC
COURSE NAME : FLUID MECHANICS COURSE CODE: BNP 10303

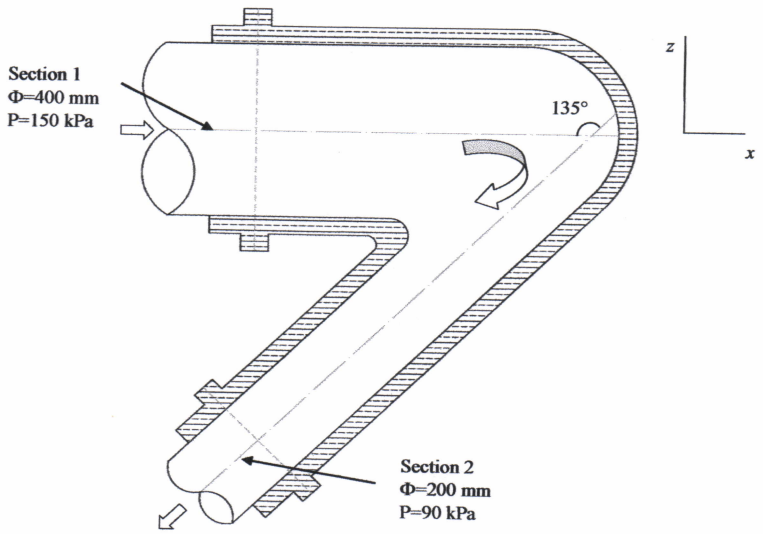

FIGURE Q2 (c)

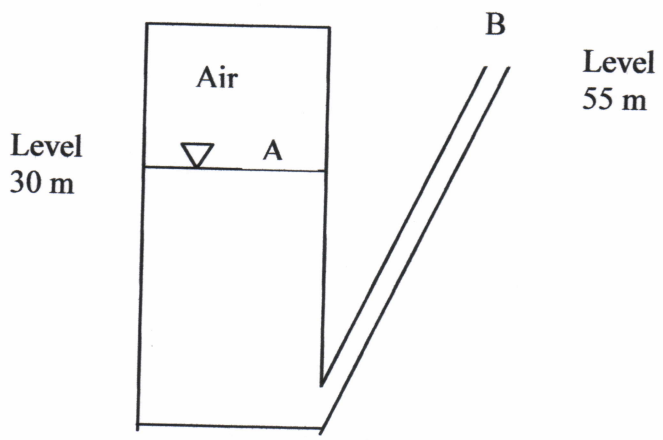

FIGURE Q3 (c)

FINAL EXAMINATION

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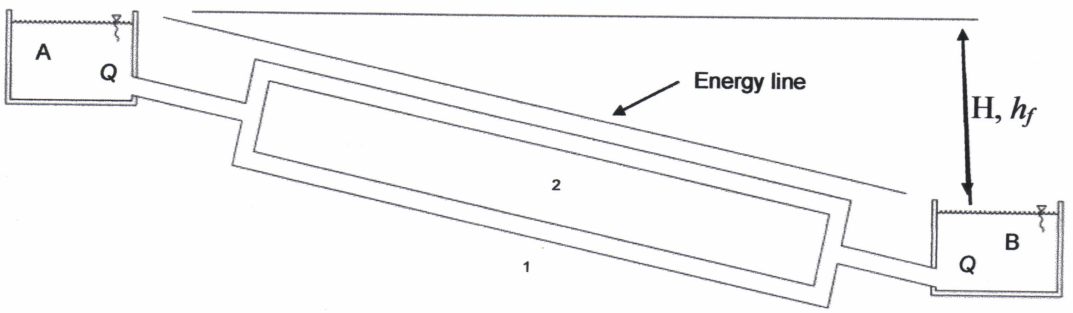

FIGURE Q4 (b)

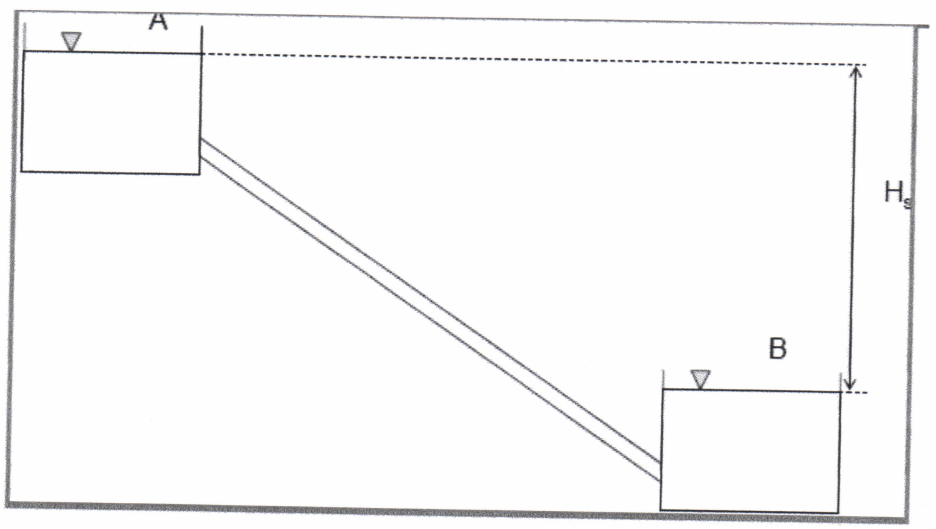

FIGURE Q4 (c)

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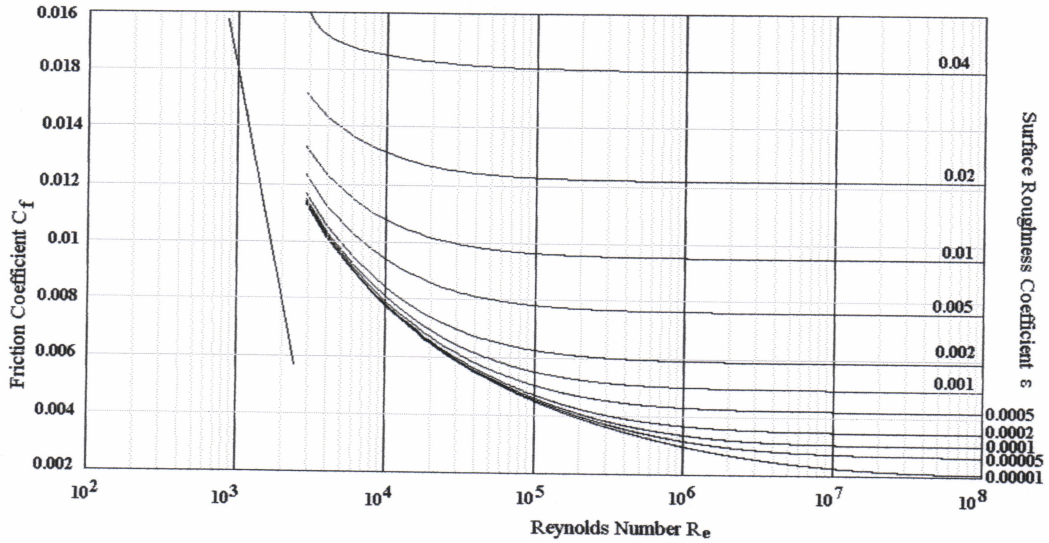

APPENDIX 1