



**UNIVERSITI KUALA LUMPUR
MALAYSIA FRANCE INSTITUTE**

**FINAL EXAMINATION
JANUARY 2014 SESSION**

SUBJECT CODE : FRB 20103
SUBJECT TITLE : THERMODYNAMICS AND HEAT TRANSFER
LEVEL : BACHELOR
TIME/DURATION : 3 HOURS 9.00 am - 12.00 noon
DATE : 02 JUN 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 illustration.
 5. This question paper consists of TWO (2) sections. Section A and B. Answer all questions in Section A. For Section B, answer two(2) question only.
 6. Answer all questions in English.
 7. Periodic Table is Appended (RETURNABLE)
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THERE ARE 6 PRINTED PAGES OF QUESTIONS EXCLUDING THIS PAGE.

SECTION A (Total: 60 marks)**INSTRUCTION: Answer ALL questions.****Please use the answer booklet provided.****Question 1**

(a) What is the difference between gage pressure and absolute pressure?

(5 Marks)

(b) The piston-cylinder device containing a gas has a mass of 60kg and a cross sectional area of 0.04m^2 . The local atmospheric pressure is 0.97 bar and gravitational acceleration is 9.8 m/s^2 . Determine the pressure inside the cylinder.

(5 Marks)

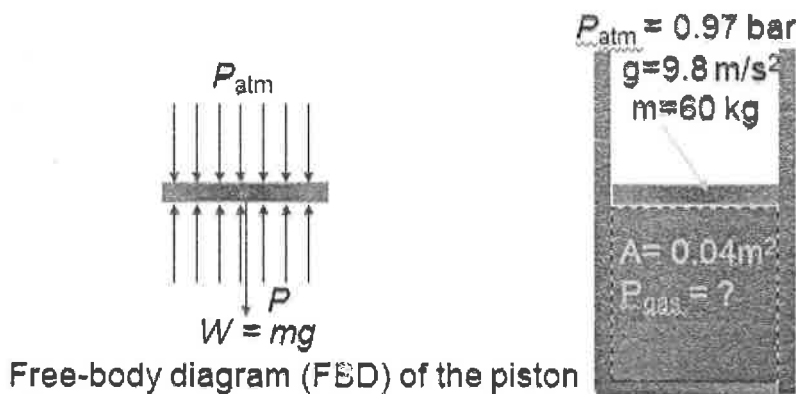


Figure Q1(b) The piston -cylinder

Question 2

(a) What is the difference open system and closed open?

(4 Marks)

(b) Identify which of the following open or closed system

- i- compressor
- ii- nozzle
- iii- turbine
- iv- sealed can
- iv- Car radiator
- v- Pressure cooker

(6 Marks)

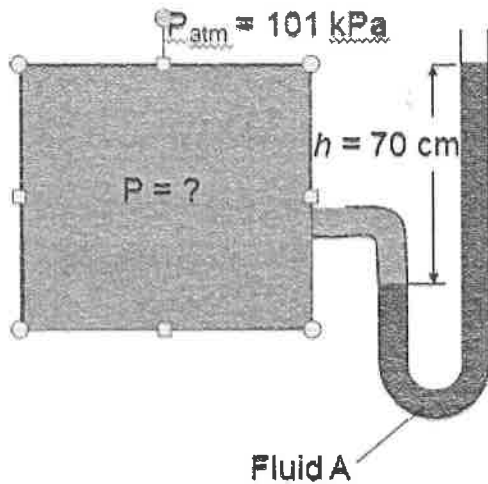


Figure Q2(c) : Manometer

- (c) Refer to Figure Q2(c), A manometer is used to measure the pressure in a tank. The fluid A used has a specific Gravity of 0.85, and the manometer column height is 70 cm. If the local atmospheric Pressure is 101kPa, determine the absolute pressure within the tank. (10 Marks)

Question 3

- (a) Define what is First Law and Second Law of Thermodynamics?

(4 Marks)

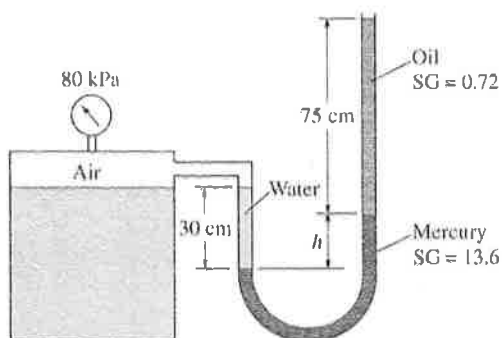


Figure Q3(b) : The gage pressure in the tank

- (b) Refer to figure Q3(b), The gage pressure of the air in the tank is measured to be 80 kPa.

Determine:

i. the differential height h of the mercury column

(8 Marks)

ii. the differential height h of the mercury column if a gage pressure of 50kPa.

(8Marks)

(c) A piston-cylinder contains 25g of saturated water vapor which is maintained at constant pressure of 300kPa. A resistance heater within the cylinder is turned and passed a current of 0.2A for 5min from a 120V source. At the same time a heat loss of 3.7 kJ occurs. Show that:

i. For a CS the boundary work W_b and the change in the internal energy ΔU in its relation to ΔH

ii. Determine the final temperature of the steam

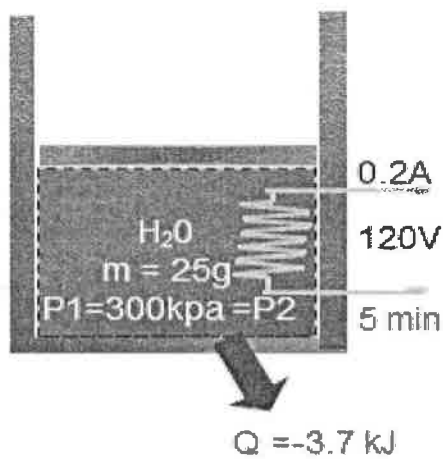


Fig.Q3(c) Piston-cylinder

(10Marks)

SECTION B (Total: 40 marks)

INSTRUCTION: Answer only TWO questions.

Please use the answer booklet provided.

QUESTION 4

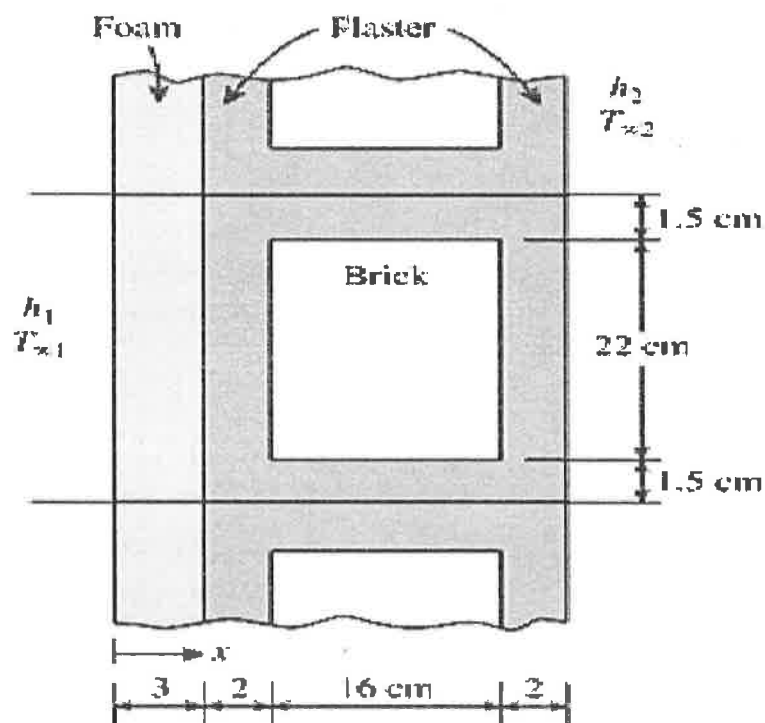


Figure Q4(b): Glass Windows experiment.

(a) Describe the optimum economic view for heat transmission through the building.

(6Marks)

(b) A 3-m-high and 5-m-wall consists of long 16-cm x 22 cm cross section horizontal bricks ($k=0.722 \text{ W/m.K}$) separated by 3-cm-thick plaster layers ($k=0.22 \text{ W/m.K}$). There are also 2 cm thick plaster layers on each side of the brick and a 3 cm thick rigid foam ($k=0.026 \text{ W/m.K}$) on the inner side of the wall, as shown figure above. The indoor and the outdoor temperatures are 22 C and -10C, respectively, and the convection heat transfer coefficient on the inner and the outer side are $h_1= 10 \text{ W/m}^2\text{K}$ and $h_2=25 \text{ W/m}^2\text{K}$, respectively. Assuming one-dimensional heat transfer and disregarding radiation,

determine

i. The individual Resistance of Rconvection inner and outer in C/W..

(6Marks)

ii. The total resistance C/W.

(6Marks)

iii. The rate of heat transfer through the wall

(8Marks)

QUESTION 5

An insulated vessel is divided into two compartments connect by a valve. Initially, one compartment contains steam at 1.0 MPa, 500 °C, and other is evacuated. The valve is opened and the steam is allowed to fill the entire volume, achieving a final pressure of 0.1 MPa. Determine,

(a) The final temperature in °C.

(6Marks)

(b) The % of the vessel volume initially occupied by steam.

(6Marks)

(c) Entropy generation S_{gen} in kJ/kg K

(8Marks)

QUESTION 6

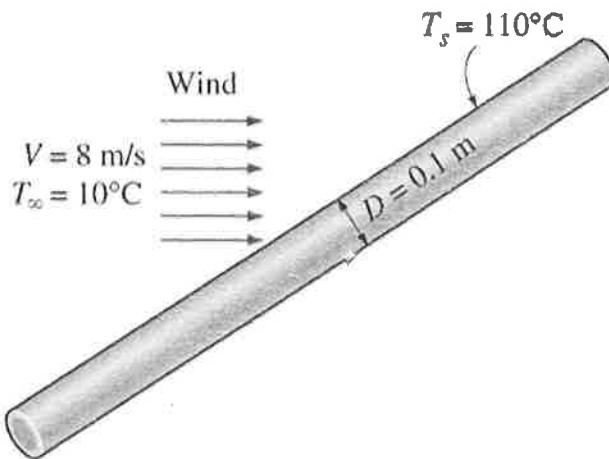


Figure Q6: Heat Loss from a Steam Pipe in Windy Air

Referring to figure Q4, A long 10 cm diameter steam pipe whose external surface temperature is 110°C passes through some open area that is not protected against the winds as figure above. Calculate:-

- (a) The Reynold number (6 Marks)
- (b) The heat transfer coefficient h , in $\text{W/m}^2\cdot\text{K}$ (8 Marks)
- (c) The rate of heat loss from the steam in W (3 Marks)

END OF QUESTION