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CONFIDENTIAL

SET A

UNIVERSITI KUALA LUMPUR
Malaysia France Institute

FINAL EXAMINATION
JANUARY 2010 SESSION

SUBJECT CODE	:	FRB 20102/FMB 32202
SUBJECT TITLE	:	BASIC THERMODYNAMICS/THERMODYNAMICS
LEVEL	:	BACHELOR
TIME / DURATION	:	9.00am – 11.00am (2 HOURS)
DATE	:	08 MAY 2010

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 questions paper consists of FIVE (5) questions. Answer FOUR (4) questions only.
6. Answer ALL questions in English.

THERE ARE 3 PAGES OF QUESTIONS, EXCLUDING THIS PAGE.

INSTRUCTION: Answer ONLY FOUR (4) questions

Please use the answer booklet provided.

Question 1

A piston-cylinder device initially contains 1.4 kg saturated liquid at 200° C as in Figure Q1. Now heat is transferred to the water until the volume quadruples (4 X) and the cylinder contains saturated vapour only. Determine:

(a) The volume of the tanks

(6 marks)

(b) The final temperature.

(6 marks)

(c) The final pressure.

(6 marks)

(d) The change of internal energy of the water.

(7 marks)

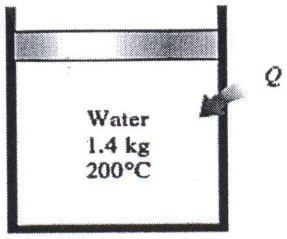

Figure Q1. A piston-cylinder device

Question 2

Two externally insulated tanks (Tank A and Tank B) are separated by a partition as in Figure Q2. Initially Tank A contains 2kg of steam at 1 MPa and 300°C whilst Tank B contains 3kg saturated liquid–vapor mixture with a vapor mass fraction of 50 percent. Now the partition is removed and the two sides are allowed to mix until the mechanical and thermal equilibrium are re-established. If the pressure at the final state is 300 kPa, determine

(a) The temperature and quality of the steam (if mixture) at the final state.

(12 Marks)

(b) The amount of heat lost from the tanks.

(13 Marks)

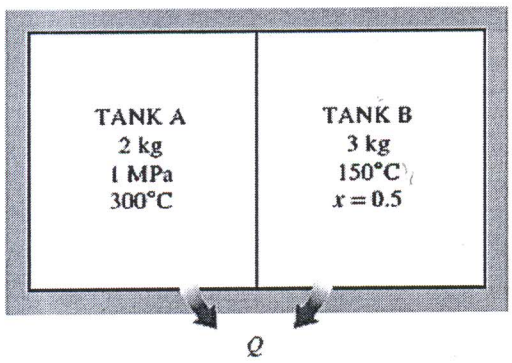

Figure Q2. Tank separated by a partition

Question 3

Steam at 40°C condenses by the cooling water on the outside of a 5-m long, 3-cm-diameter thin horizontal copper tube by cooling water that enters the tube at 25°C at an average velocity of 2 m/s and leaves at 35°C as in Figure Q3. Determine:

(a) The mass flow rate of cooling water.

(10 marks)

(b) The rate of condensation of the steam.

(15 marks)

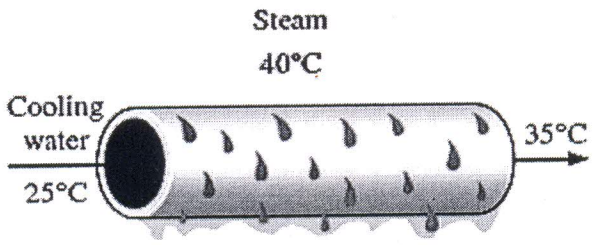

Figure Q3. Condenser water tube

Question 4

Air enters an adiabatic compressor at 100 kPa and 17° C at a rate of 2.4 m^3/s and it exits at 257° C. The compressor has an isentropic efficiency of 84%. Neglecting the changes in kinetic and potential energies, determine:

(a) The exit pressure of air.

(12 marks)

(b) The power required to drive the compressor.

(13 marks)

Question 5

Air is compressed by an adiabatic compressor from 95kPA and 27° C to 600 kPA and 27° C. Assuming variable specific heats and neglecting the changes in kinetic and potential energies, determine:

(a) The isentropic efficiency of the compressor.

(10 marks)

(b) The exit temperature of air if the process were reversible.

(15 marks)

END OF QUESTION