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CONFIDENTIAL

SET A

UNIVERSITI KUALA LUMPUR
Malaysia France Institute

FINAL EXAMINATION

SEPTEMBER 2014 SESSION

SUBJECT CODE	:	**FRB30203**
SUBJECT TITLE	:	**APPLIED THERMODYNAMICS**
LEVEL	:	**BACHELOR**
TIME / DURATION	:	**9.00 AM – 12.00 PM (3 HOURS)**
DATE	:	**2 JANUARY 2015**

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 only ONE section. Answer ALL questions.**
6. **Answer all questions in English.**
7. **This is an opened book examination.**

THERE ARE 2 PRINTED PAGES OF QUESTIONS, EXCLUDING THIS PAGE.

INSTRUCTION: Answer ALL questions.

Please use the answer booklet provided.

Note: All questions are independent of each other.

Question 1

An adiabatic turbine is supplied with steam at 40 bars, 400°C which expands through a turbine in a steady flow to an exit pressure of 2 bars and a quality of 97%. The turbine inlet velocity is negligible, but the steam leaves at high velocity through a pipe of 0.14 m^2 cross sectional area. If the mass flow rate is 3 kg/s, and the turbine isentropic efficiency is 90%, calculate the power output of the turbine and show that the process is irreversible.

(13 marks)

Question 2

Steam is supplied to a two stage turbine at 40 bars and 350°C. It expands in the first stage turbine until it is saturated vapour, and then it is reheated to 350°C and expands through the second stage turbine. The condenser pressure is 0.03 bar. Calculate the work output of the turbine and the cycle efficiency. Assume that the cycle is an ideal cycle.

(13 marks)

Question 3

Gaseous methane is burned with 200% theoretical air and the reactants are supplied as gases at the reference temperature and pressure (S.T.P.). The products are flowing through a heat exchanger where they give off energy to some water flowing in at 20°C, 500 kPa and out at 700°C, 500 kPa. The products exit at 400 K to the chimney (See Figure 1). By assuming that the water produced in the product gases as vapour, calculate:

a. How much energy per kmole fuel can the products deliver?

(7 marks)

b. How much kg water per kg fuel can they heat?

(7 marks)

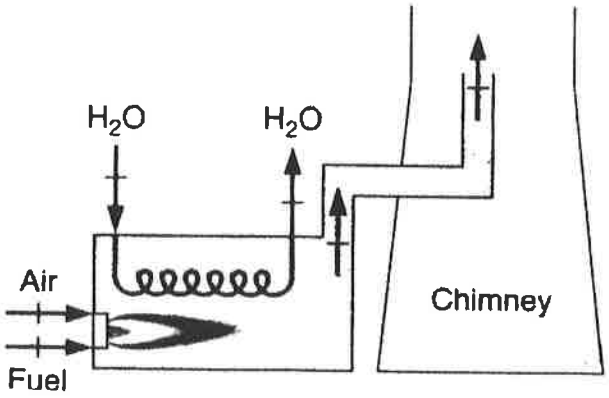

Figure 1

END OF QUESTIONS

APPENDIX

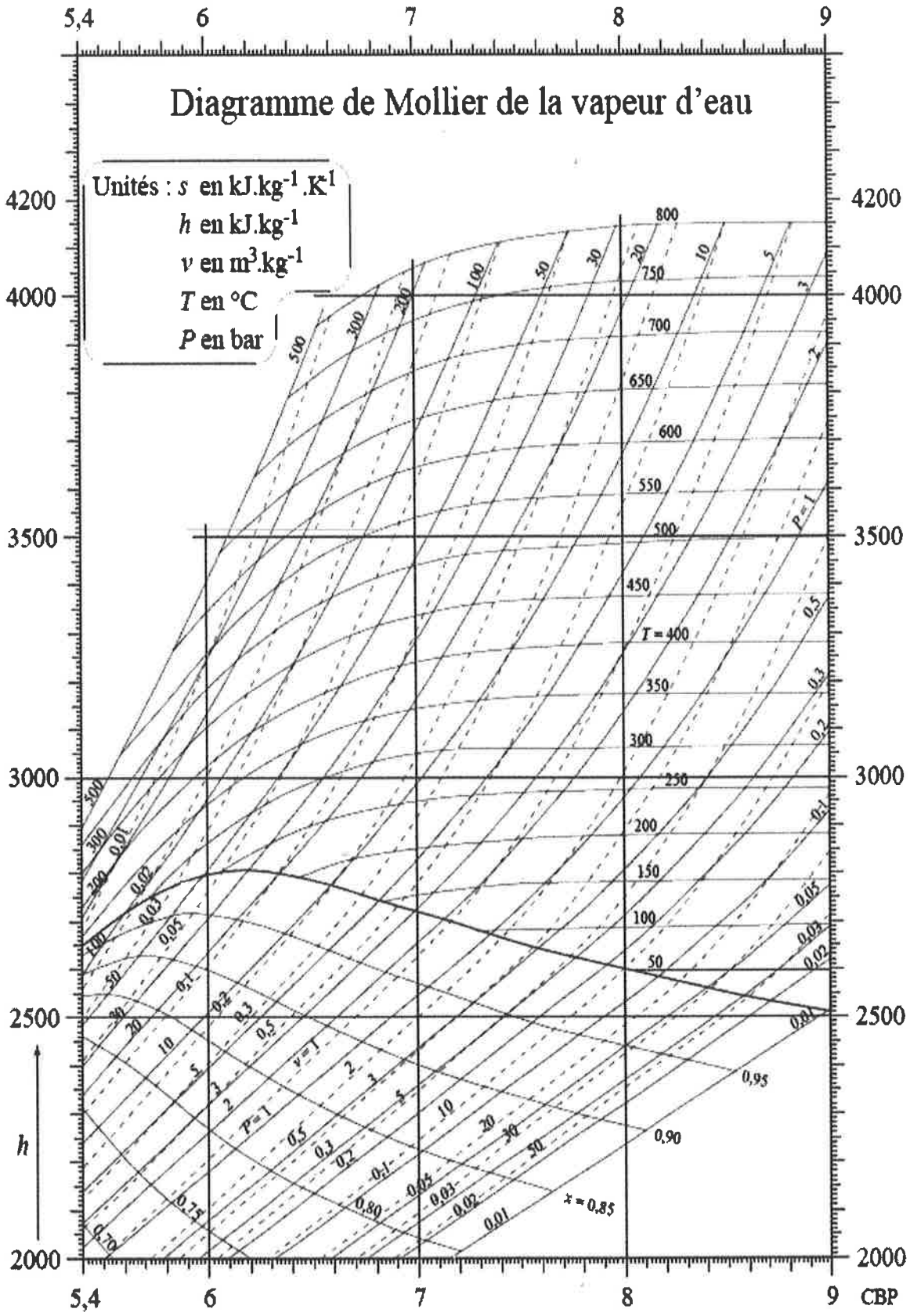
Diagramme de Mollier de la vapeur d'eau
Unités : s en kJ.kg-1.K-1
h en kJ.kg-1
v en m3.kg-1
T en °C
P en bar
h
CBP

Figure 2