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CONFIDENTIAL

SET A

UNIVERSITI KUALA LUMPUR
Malaysia France Institute

FINAL EXAMINATION
JANUARY 2014 SESSION

SUBJECT CODE	:	FRB 10102/3
SUBJECT TITLE	:	REFRIGERATION FUNDAMENTAL
LEVEL	:	DEGREE
TIME / DURATION	:	9.00 am - 11.00 am (2 HOURS)
DATE	:	29 MAY 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 ONE (1) section only. Answer ALL question
6. Answer all questions in English.
7. Mollier and Psychrometric chart is appended must be submitted together with question booklet

THERE ARE 3 PAGES OF QUESTIONS, EXCLUDING THIS PAGE.

INSTRUCTION: Answer ALL questions.
Please use the answer booklet provided.

Question 1

(a) Describe the definition of Air conditioning

(5 marks)

(b) State four (4) type of Air conditioner

(8 marks)

(c) Basic cycle:

i. State four (4) components of basic cycle

(4 marks)

ii. Describe the function of four (4) components in basic cycle

(8 marks)

Question 2

(a) State the function and location of installation for accessories normally use in the refrigeration system.

i. Liquid receiver.
ii. Dryer filter
iii. Accumulator
iv. Injection capillary
v. Muffler

(20 marks)

(b) When selecting a refrigerant for certain application. What properties is said to be suitable for use as a refrigerant? Give five (5) properties.

(5 marks)

Question 3

A basic refrigeration system uses R-134a as refrigerant which the cycles without pressure drop at refrigerating capacity is 50kW measured data such as:

- Low pressure : 3 Bar
- Suction temperature : 5°C
- High pressure : 9 Bar
- TXV Temperature : 35°C

(a) Draw the Refrigeration cycle diagram using Mollier chart (**Appendix 2**)

(7 marks)

(b) Determine the discharge temperature , sub cool and the superheat

(8 marks)

(c) Calculate the:

i. Compression ratio
ii. Flash gas
iii. Refrigerant effect
iv. Circulation rate of refrigerant
v. Power at compressor
vi. COP

(12 marks)

Question 4

Figure Q4 below shows the cooling coil passing through an Air Handling Unit (AHU). The volume flow rate of air is 67 cfm with the a temperature at entry of 32.2°C (DB) / 60% RH and the leaving condition of 10°C (DB) saturated after the cooling coil.

a) Determine the properties of specific volume , wet bulb , grain of moisture and enthalpy for entering air and leaving cooling coil air by using psychrometric chart (Appendix 2) please submit with the answer booklet .

(10 marks)

b) Calculate :

i. The heat added (Δh)

(2 marks)

ii. The grain of moisture added (Δw)

(2 marks)

iii. Sensible heat

(2 marks)

iv. Latent heat

(2 marks)

v. Total heat

(2 marks)

vi. Total heat

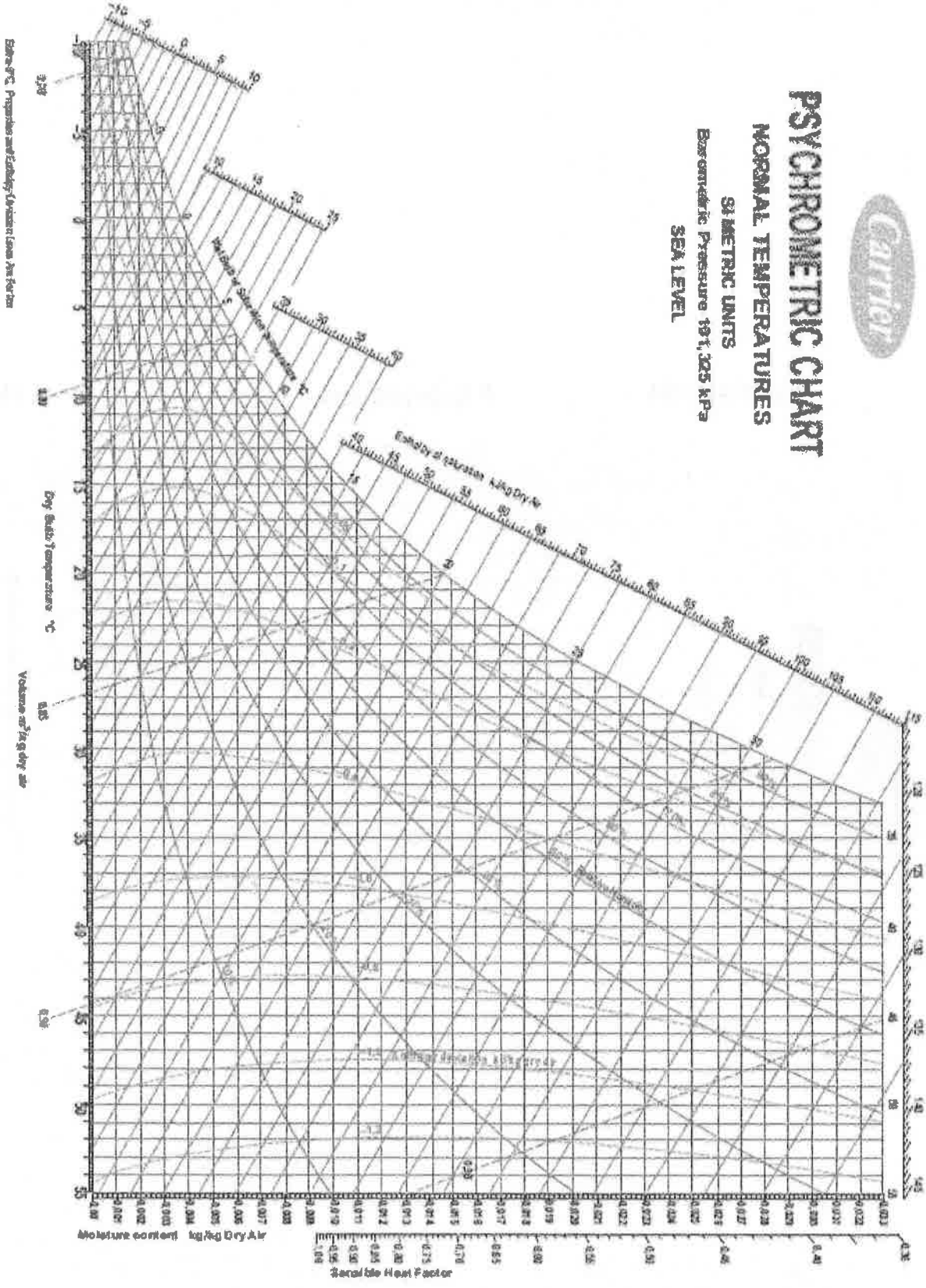
(2 marks)

vii. Between the total heat from question (v) and (vi) what is your conclusion?

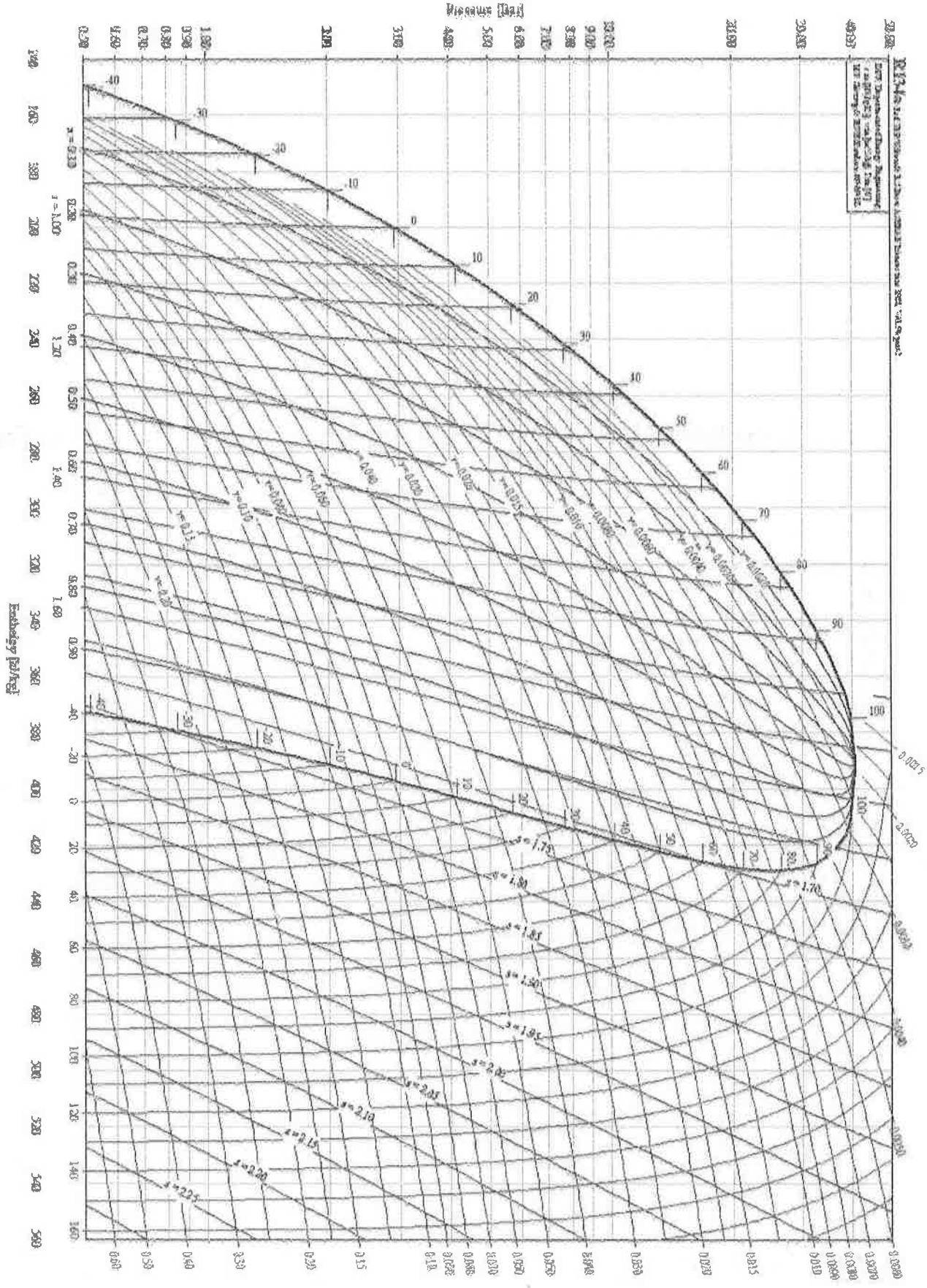
(3 marks)

END OF QUESTION

Appendix 1


PSYCHROMETRIC CHART
NORMAL TEMPERATURES
SI METRIC UNITS
Barometric Pressure 101.325 kPa
SEA LEVEL
Carrier
Dry Bulb Temperature °C
Moisture content kg/kg Dry Air
Sensible Heat Factor

Appendix 2



FORMULA

Mollier chart

a. Compression ratio
= High pressure / Low pressure

b. Flash gas
= (h4 – h4') / (h1 – h4')

c. Refrigerant effect
= (h1 – h4)

d. Circulation rate of refrigerant
= refrigerating capacity / refrigerant effect

e. Power at compressor
= circulation rate x (h2 - h1)

f. COP
= Refrigerating capacity / Power at compressor
or
= (h1 – h4) / (h2 – h1)

Psychrometric chart

IP unit

a. Volume flow rate = Area x Velocity

b. Q sensible = 1.08 x cfm x Δt

c. Q latent = 0.68 x cfm x Δw

d. Q total = Q sensible + Q latent

SI / metric unit

a. The rate of heat transfer(Kw)
Q = mass flow rate (kg/s)x Δ enthalpy(kJ/kg) = ma ($h_{entering} - h_{leaving}$)
($Q_{cooling\ coil\ (air)} = Q_{refrigeration\ cycle\ (Refrigerant)}$)

b. Q_{de} = mass flow rate x Δ ratio moisture = ma ($W_{entering} - W_{leaving}$)