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CONFIDENTIAL

SET A

UNIVERSITI KUALA LUMPUR

MALAYSIA FRANCE INSTITUTE

FINAL EXAMINATION

JANUARY 2014 SESSION

SUBJECT CODE	:	FCB 40802
SUBJECT TITLE	:	GEOTHERMAL HEAT PUMP AND SOLAR AIR CONDITIONING
LEVEL	:	BACHELOR
TIME/DURATION	:	3.00 PM – 5.00 PM (2 HOURS)
DATE	:	30 MAY 2014

INSTRUCTIONS TO CANDIDATES

1. All documents authorized (Open Book Examination)
2. Please read the instructions given in the question paper CAREFULLY.
3. This question paper is printed on both sides of the paper.
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.

THERE ARE 5 PRINTED PAGES OF QUESTIONS, EXCLUDING THIS PAGE

INSTRUCTION: Answer ALL questions.

Please use the answer booklet provided.

Question 1

(a) What is the Renewable Energy?

(1marks)

(b) Why is the strategic for widespread application of Renewable Energy?

(1marks)

(c) Give 3 example of Renewable Energy and Non Renewable Energy

(1marks)

Question 2

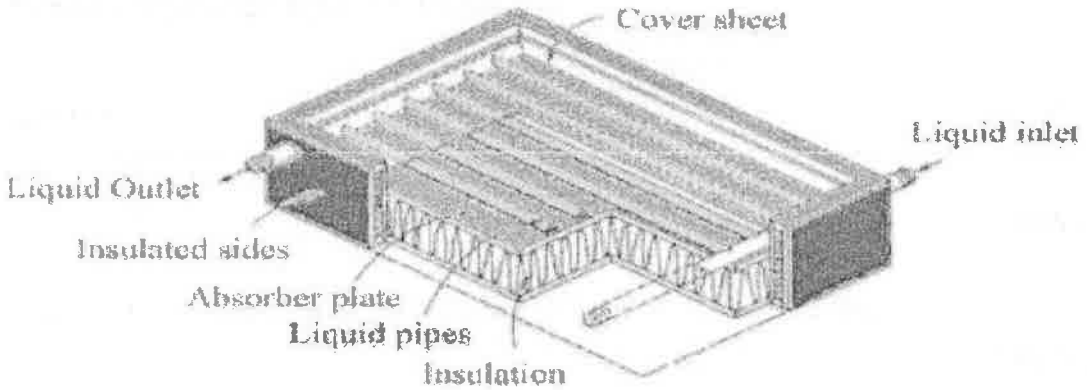


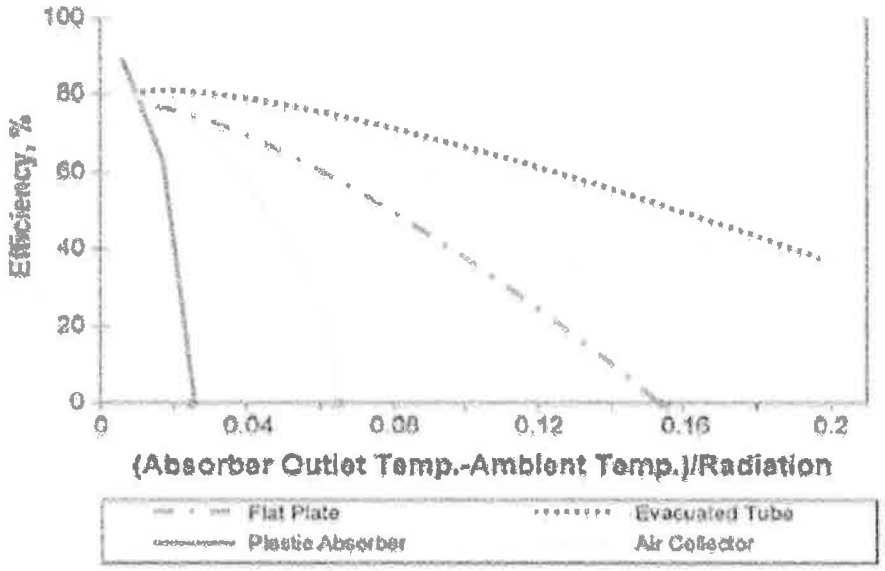
Figure Q2(a): Flate plate Collector

(a) Referring figure Q2(a), Explain in detail the operation of an Flat Plate Collector system to produce the hot water.

(1 Marks)

(b) Solar thermal collector can be categorized by low-temp. collectors, mid-temperature collectors, high-temperature collectors. Give 2 application of each categories.

(1 Marks)



(c) Please arrange the types collector efficiency from the **best to the worst** :-

[Plastic Absorber], [Flat Plate], [Evacuated],

(1 Marks)

(d) Draw Passive, Thermosyphon and Direct System

(1 Marks)

Question 3

(a) Explain three types of desiccant components and its operation.

(1Marks)

(b) Referring Figure Q3(b) is the Schematic Desiccant Cooling System

i. , Explain each of the processes 1-2, 2-3, 3-4, 4-5, 5-6, 6-7, 7-8, 8-9,9-10.

ii. Sketch the process In psychrometric chart and estimate a saving obtained by the system

(3Marks)

(c)This system require 60-80C hot water for regeneration process. Which type of solar collector suitable for these application? Why?.

(1Marks)

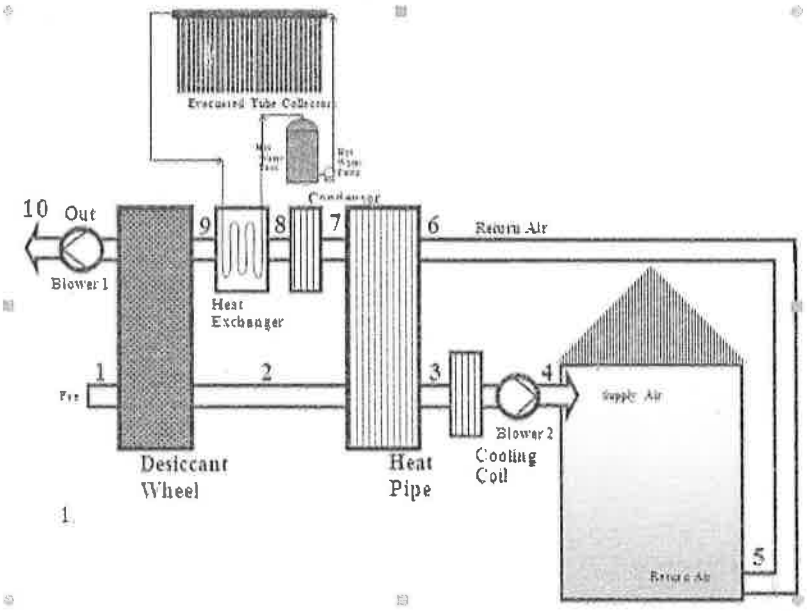


Figure Q3(b): The Schematic Desiccant Cooling System

Table Q3(c). Measurement Data of the system system

Point	T_{db} (°C)	T_{wb} (°C)	T_{dp} (°C)	ω (kg air/kg udara kering)	⍰ (%)	h (kJ/kg dry air)
1	31.8	28.1	27.2	23.10	81.63	90.02
2	44.7	28.5	23.5	18.00	30.3	91.9
3	35.5	26.3	23.3	18.00	49.5	81.9
4	26.9	26	25.7	21.246	93.6	80.6
5	30.9	28.4	27.7	23.675	83	91.6
6	28.7	28.6	28.6	25.000	99.4	92.8
7	40.7	31	28.6	24.900	50.9	105.2
8	48.7	32.5	28.6	25.050	33.9	113.7
9	38.3	34.1	33.1	32.832	75.4	122.9

(d) Refering to the table above, calculate:

(i) Effieciency of the heat pipe heat exchanger

(ii) Efficiency of the desiccant wheel

(iii) COP of the system

(2marks)

Question 4

(a) What the averages COP of a typical GHP system during the first ten years for Heating mode and cooling mode?

(1marks)

(b) Write the comparison between geothermal heat pump and Air Source Heat Pump.

(1marks)

(c) Write the types of earth heat exchangers? Sketch the operation of a ground –coupled cooling system.

(1marks)

Question 5

(a) What is the difference between a low energy building and a zero energy building?

(1marks)

(b) What is an integrated design process? How does it differ from conventional design process?

(1marks)

(c) Explain in sentences each the six categories in a green building rating system of Green Building Index (GBI).

(1marks)

(d) What the different between GBI and LEED?

(1marks)

(e) Does green building cost more? Give two (2) reasons to support your answer.

(2marks)

END OF QUESTION

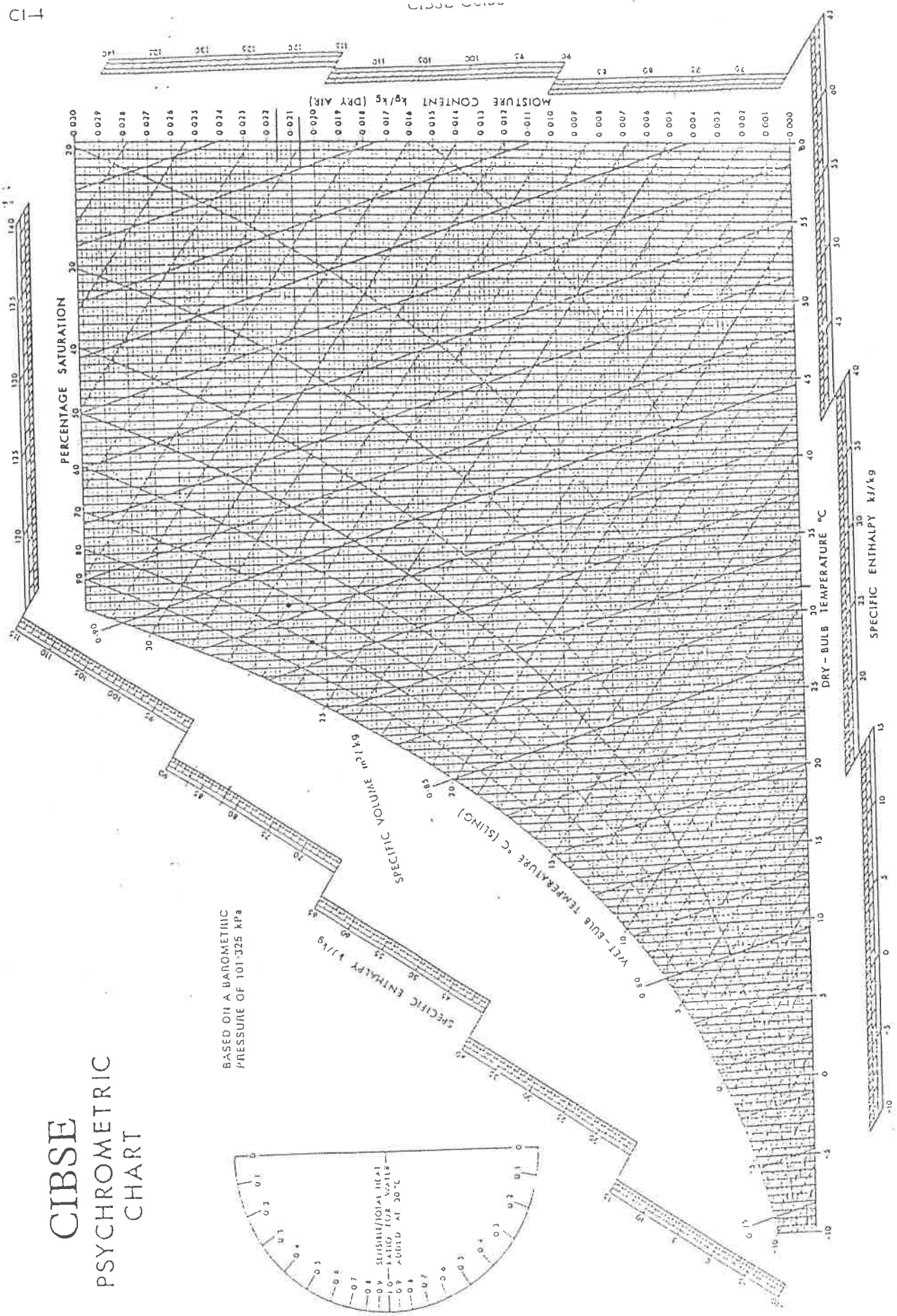


Fig. C1.2. CIBSE Psychrometric Chart I – 10°C to 60°C).

Pads of 50 charts (A3 size) are available from the CIBSE, Delta House, 222 Balham High Road, London SW12 9BS