



UNIVERSITI KUALA LUMPUR
Malaysia France Institute

FINAL EXAMINATION
JULY 2010 SESSION

SUBJECT CODE : FCD 20303
SUBJECT TITLE : DUCTING AND PIPING SYSTEM
LEVEL : DIPLOMA
TIME / DURATION : 9.00am – 12.00pm
(3 HOURS)
DATE : 19 NOVEMBER 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 question paper consists of FOUR (4) questions. Answer ALL questions.
 6. Answer all questions in English.
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THERE ARE 4 PAGES OF QUESTIONS AND 3 PAGES OF APPENDIX, EXCLUDING THIS PAGE.

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

Question 1

Drawing Q1(a) and Q1(b) show a 2 storey bank floor layout. The floor to ceiling height is 12 feet. There is an air handling unit (AHU) room at each floor. As shown, each floor served different purposes; Ground floor as waiting lounge and banking hall, whereas 1st floor is the common office area, manager and meeting rooms. The air conditioning system installed for the building shall be the water-cooled package unit. The cooling tower and condenser water pumps shall be installed at the Ground Floor.

- (a) Referring to the attachment 1, estimate the total supply air that need to be supplied to each area on Ground Floor.
(10 Marks)
- (b) Estimate the fresh air intake should be supplied to the whole Ground Floor air conditioned area.
(5 Marks)
- (c) Estimate the exhaust air amount for each toilet at each floor.
(5 Marks)
- (d) What is the air change per hour for the toilet exhaust system that you are proposing based on your calculation above?
(5 Marks)

Question 2

- (a) Based on your calculation in Question 1, sketch your proposed ducting layout in single line diagram complete with duct dimensions and air diffusers location for Ground Floor for its
- i air conditioning system (12 Marks)
 - ii centralized toilet ventilation system (5 Marks)
- (b) what method that you are using to size up your duct dimension? (3 Marks)
- (c) what type of fan that you would propose for the centralized toilet ventilation system? Justify your selection in terms of the features and advantages of the selected fan type. (5 Marks)

Question 3

- (a) Assume that cooling capacity for both floors is identical. Estimate the cooling capacity for Ground Floor. (8 Marks)
- (b) Based on your calculation above, sketch your proposed condenser water piping layout in single line diagram for the whole building complete with pipe dimension. (8 Marks)
- (c) Sketch the typical connections for
- i. Cooling tower
 - ii. Condenser water pump
 - iii. Water-cooled package unit

(9 Marks)

Question 4

During testing and commissioning of the WCP system, you as the HVAC engineer received test report from your technicians as shown below.

Table Q4: WATER-COOLED PACKAGE UNIT TEST SHEET

ITEM	DESCRIPTION	DESIGN	ACTUAL
1	Fan Type	Centrifugal	Centrifugal
2	Air Volume (L/s)	8,000	6,700
3	Motor HP / RPM	15 / 1450	15 / 1452
4	Motor Type	TEFC	TEFC
5	Running Amp. / Ampere	-	17.7
6	Full Load Amp. / Ampere	20.2	20.2
7	Volts / Phase / Hertz	415 / 50	415 / 50
8	Blower Pulley, Inch	5	5
9	Motor Pulley, Inch	4	4
10	Belt Size / Qty	2	2
11	Compressor Running Amp. / Ampere	-	-
ITEM	DESCRIPTION	YES	NO
12	Check Primary Filter	/	
13	Check No Vibration Noise	/	
14	Check Thermostat	/	
15	Check Cooling Coil & Drainage	/	
16	Check BCMS Interlocking	/	

- (a) State fan laws for a given fan size, duct system and air density. (9 Marks)
- (b) Analyze the test report above. Propose the necessary action to be taken (if any). (16 Marks)

END OF QUESTION

Attachment 1



MFI

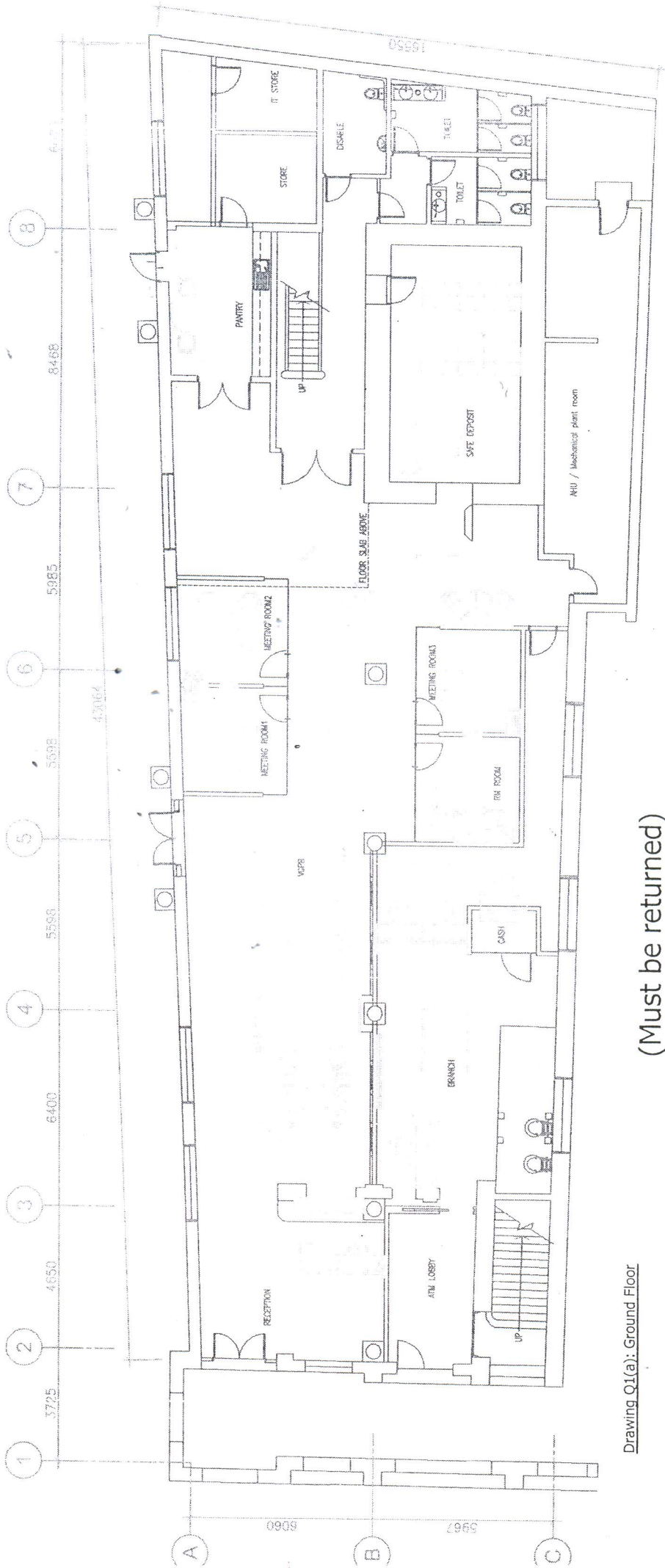
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COOLING LOAD

Table 1: Design Cooling Load Check Figure:

DESIGN AND COOLING LOAD CHECK FIGURES																														
Applications	Occupancy Sq Ft / Person			Lighting Watts / Sq Ft			Fresh CFM / Person			Air CFM / Sq Ft			Room Sensible Btuh / Sq Ft			Room Total Btuh / Sq Ft			Grand Total Btuh / Sq Ft			Refrigeration Sq Ft / Ton*			Supply Air CFM / Sq Ft					
	Lo	Avg	Hi	Lo	Avg	Hi	Lo	Avg	Hi	Lo	Avg	Hi	Lo	Avg	Hi	Lo	Avg	Hi	Lo	Avg	Hi	Lo	Avg	Hi	Lo	Avg	Hi	Lo	Avg	Hi
Apartments (Flats)	150	100	50	1.0	2.0	4.0	25	35	40	25	.35	.50	15	25	45	20	30	50	30	40	60	400	300	200	75	1.25	1.75	1.25	1.5	2.5
Auditoriums, Theaters	15	10	5	1.0	2.0	3.0	5.0	15	30	50	1.5	2.5	25	35	50	45	55	70	60	80	120	200	150	100	1.25	1.5	2.5	1.5	2.0	3.0
Educational Facilities																														
Classrooms	30	25	20	2.0	4.0	6.0	5.0	7.5	10	20	.30	.40	25	40	55	35	50	65	45	60	80	275	200	150	1.0	1.4	1.8	1.4	1.8	2.1
Laboratories	75	60	40	2.0	3.0	6.0	10	15	20	20	.40	.60	30	40	55	45	65	85	60	75	110	275	200	160	1.0	1.4	1.8	1.5	2.0	2.5
Cafeteria-Coffee House	20	15	10	1.5	3.0	4.5	7.5	10	15	40	.60	.80	25	45	65	35	60	75	55	80	110	225	150	110	1.0	1.5	2.1	1.5	2.1	2.5
Factories																														
Public Areas	50	35	25	3.0	4.5	6.0	5.0	10	15	10	.25	.50	20	45	75	30	60	85	50	80	130	240	150	90	1.0	1.0	2.25	3.0	3.0	3.0
Light Manufacturing	200	150	100	9.0	10.0	12.0	5.0	10	15	05	.10	.15	35	55	75	40	60	80	80	120	200	150	100	150	1.5	1.5	2.75	3.0	3.0	3.0
Heavy Manufacturing**	300	250	200	15.0	15.0	60.0	5.0	10	15	03	.08	.10	75	115	155	80	120	160	120	150	200	100	80	60	3.0	4.0	6.5	4.0	4.0	6.5
Hospitals																														
Patient Rooms†	100	60	40	1.0	2.0	3.0	75	90	100	75	1.6	2.5	15	35	50	20	40	55	60	120	165	200	100	75	75	1.2	1.7	1.2	1.7	1.7
Public Areas	130	100	65	2.0	3.0	4.0	10	20	30	25	.75	1.5	10	15	35	15	20	40	30	45	100	400	275	120	75	1.2	1.7	1.2	1.7	1.7
Laboratories	150	100	50	2.0	5.0	10.0	20	30	50	20	.50	1.0	25	45	60	30	55	70	45	70	100	275	175	120	1.0	1.0	1.5	2.0	2.0	2.0
Libraries	150	100	50	2.0	4.0	6.0	5.0	7.5	10	10	.20	.30	20	30	50	25	35	55	30	45	70	400	275	175	1.0	1.1	1.7	1.1	1.1	1.7
Doctors Clinics	150	100	50	2.0	4.0	6.0	20	25	30	25	.40	.60	20	40	60	25	45	65	40	60	80	300	200	150	1.0	1.4	2.0	1.4	2.0	2.0
Offices																														
Private	150	125	100	4.0	6.0	8.0	20	25	30	25	.40	.60	25	50	75	30	55	80	40	75	90	300	175	135	1.0	1.7	2.4	1.7	2.4	2.4
General-Perimeter	125	100	75	4.0	6.0	8.0	10	15	20	15	.25	.40	20	35	50	25	40	55	40	75	100	400	250	150	1.0	1.2	2.3	1.2	2.3	2.3
General-Interior	125	100	75	4.0	6.0	8.0	10	15	20	15	.25	.40	15	20	30	20	25	35	25	30	40	475	400	300	75	1.0	1.1	1.0	1.1	1.1
Conference Rooms	45	30	15	4.0	6.0	8.0	20	30	50	40	1.0	1.5	30	55	80	40	65	90	60	85	120	200	150	100	1.0	1.8	2.7	1.8	2.7	2.7
Restaurants	25	20	15	1.5	1.7	2.0	10	15	20	50	.75	1.0	30	35	50	40	50	70	60	85	120	200	150	100	1.25	1.5	2.0	1.5	2.0	2.0
Shopping Centers																														
Beauty & Barber Shops	45	40	25	3.0	5.0	9.0	7.5	15	20	20	.50	1.0	25	35	55	30	40	60	50	60	80	250	200	150	1.25	1.5	2.0	1.5	2.0	2.0
Department Stores -Basement	40	30	20	3.0	4.0	5.0	5.0	7.5	10	10	.20	.25	20	30	45	25	35	50	35	45	60	325	275	200	1.0	1.4	1.75	1.4	1.75	1.75
-Main Floor	40	25	20	4.0	6.0	9.0	5.0	7.5	10	15	.25	.35	25	35	45	30	40	50	40	50	60	300	250	200	1.0	1.5	2.0	1.5	2.0	2.0
-Upper Floors	80	50	40	2.0	4.0	6.0	5.0	5.0	7.5	05	.10	.15	15	25	35	20	30	40	30	40	50	400	300	250	.80	1.0	1.2	1.0	1.2	1.2
	40	30	25	2.0	3.0	4.0	10	15	20	25	.35	.50	30	35	45	40	45	55	60	65	75	200	180	160	1.25	1.5	2.0	1.5	2.0	2.0
	40	25	20	3.0	4.0	6.0	5.0	7.5	10	15	.25	.35	25	35	45	30	40	50	40	50	60	300	250	200	1.0	1.4	2.0	1.4	2.0	2.0
	60	40	30	1.0	1.5	2.0	5.0	7.5	10	10	.20	.30	10	15	25	15	20	30	25	30	40	500	400	300	.75	1.2	1.5	1.2	1.5	1.5
Specialty Shops	60	50	40	2.0	3.0	4.0	5.0	7.5	10	10	.20	.30	25	35	45	30	40	50	40	50	60	300	250	200	1.2	1.4	2.0	1.4	2.0	2.0

* Refrigeration loads are for entire application. † Includes other equipment loads expressed in watts/sq ft.
 ‡ Air quantities shown are for all air systems. ** Air quantities for heavy manufacturing areas are based on supplementary means to remove excessive heat



(Must be returned)

Drawing Q1(a): Ground Floor

