



**UNIVERSITI KUALA LUMPUR**  
**Malaysia France Institute**

---

**FINAL EXAMINATION**  
**JULY 2010 SESSION**

---

**SUBJECT CODE** : FCB 21002  
**SUBJECT TITLE** : DUCTING AND PIPING NETWORK  
**LEVEL** : BACHELOR  
**TIME / DURATION** : 12.30 pm – 3.00 pm  
( 2 ½ HOURS )  
**DATE** : 18 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 ONE (1) section only. Answer ALL questions.
  6. Answer all questions in English.
- 

THERE ARE 5 PAGES OF QUESTIONS AND 2 PAGES OF APPENDICES, EXCLUDING THIS PAGE.

---

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

### Question 1

Drawing Q1 shows a research centre floor layout. There are two (2) air handling unit (AHU) rooms on this floor. As shown, the main HVAC equipment installation area is at the back of toilets. The air conditioning system installed for the building shall be the water-cooled chiller unit.

- (a) Referring to attachment 1, estimate
- i. the total supply air and return air for each area for the whole floor. (10 Marks)
  - ii. the cooling capacity for each area for the whole floor. (10 Marks)

**Question 2**

Based on your calculation in Question 1, sketch your proposed ducting layout in a single line diagram complete with duct dimensions and air diffusers location for the whole floor for its

- (a) air conditioning system (10 Marks)
- (b) toilet ventilation system. (5 Marks)
- (c) What type of fan that you would propose for the toilet ventilation system? Justify your selection in terms of the features and advantages of the selected fan type. (5 Marks)

**Question 3**

(a) Based on your calculation in Question 1, sketch your proposed piping layout complete with pipe dimension in a single line diagram for both chilled water and condenser water systems.

(10 Marks)

(b) Show typical connection for

i. Air handling unit

(5 Marks)

ii. Condenser water pump

(5 Marks)

**Question 4**

Based on your proposed ducting and piping layout in Question 2 and 3,

- (a) Calculate the total external static pressure for the air conditioning ducting system.  
(8 Marks)
- (b) Select the correct AHU model from the catalogue provided based on your calculation above.  
(2 Marks)
- (c) Calculate the total head for the chilled water system.  
(8 Marks)
- (d) Select the correct chilled water pump from the catalogue provided based on your calculation above.  
(2 Marks)

**Question 5**


Based on your calculation in Question 1,

- (a) Propose your cooling tower capacity and type for the condenser water system.  
(7 Marks)
- (b) Explain your answer to justify your proposed cooling tower.  
(10 Marks)
- (c) Select the correct cooling tower model for the above condenser water system from the catalogue provided.  
(3 Marks)

**END OF QUESTION**



Attachment 1



**UniKL - MALAYSIA  
FRANCE INSTITUTE**

**COOLING LOAD**

Table 1: Design Cooling Load Check Figure:

Applications	Occupancy Sq Ft / Person			Lighting Watts / Sq Ft			Fresh CFM / Person			Air CFM / Sq Ft			Room Sensible Btu/h / Sq Ft			Room Total Btu/h / Sq Ft			Grand Total Btu/h / 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			
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	40	60	120	400	300	200	75	125	175
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	75	55	60	80	60	80	120	200	150	100	125	15	2.5
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	80	275	200	150	1.0	1.4	1.8		
Laboratories	75	60	40	2.0	3.0	6.0	10	15	20	20	40	60	30	40	55	35	45	65	45	60	75	75	275	200	160	1.0	1.4	1.8		
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			
Factories																														
Public Areas	50	35	25	3.0	4.5	6.0	5.0	10	15	10	15	25	50	20	45	75	30	60	85	50	80	130	240	150	90	1.0	2.25	3.0		
Light Manufacturing	200	150	100	9.0†	10.0†	12.0†	5.0	10	15	25	10	15	35	55	75	40	60	80	60	80	120	200	150	100	1.5	2.75	3.0			
Heavy Manufacturing**	300	250	200	15.0†	15.0†	60.0†	5.0	10	15	30	10	15	30	115	155	80	120	160	120	150	200	100	80	60	3.0	4.0	5.5			
Hospitals																														
Patient Rooms†	100	60	40	1.0	2.0	3.0	7.5	9.0	100	75	16	2.5	15	35	50	20	40	55	60	120	165	200	100	75	75	1.2	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	405	275	120	75	1.2	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	1.5	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	405	275	175	1.0	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			
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			
General-Perimeter	125	100	75	4.0	6.0	8.0	10	15	20	15	25	40	20	35	70	25	40	75	30	50	85	400	250	150	1.0	1.2	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			
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	230	150	100	1.0	1.8	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			
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			
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	45	50	60	325	275	200	1.0	1.4	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			
-Upper Floors	80	50	40	2.0	4.0	6.0†	5.0	5.0	7.5	0.5	1.0	1.5	15	25	35	20	30	40	30	40	50	400	300	250	80	1.0	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			
	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			
	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	2	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			

\* 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.

