



UNIVERSITI TUN HUSSEIN ONN MALAYSIA

**FINAL EXAMINATION
SEMESTER II
SESSION 2011/2012**

COURSE NAME : **MECHANICAL &
ELECTRICAL SYSTEM**

COURSE CODE : **BFC 3153/BFC 32603**

PROGRAMME : **3BFF**

EXAMINATION DATE : **JUNE 2012**

DURATION : **3 HOURS**

INSTRUCTION : **ANSWER FOUR (4) QUESTIONS
ONLY**

THIS PAPER CONSISTS OF EIGHT (8) PAGES

- Q1** (a) Discuss on the importance of Mechanical and Electrical System for high rise building. Give at least **three (3)** main reasons. (6 marks)
- (b) Explain the process of heat transfer through conduction, convection and radiation. (9 marks)
- (c) A certain un-insulated cavity wall has a U-value of $0.85\text{W/m}^2\text{K}$. If insulation board is added to the construction, where the thickness of this board is 40mm, calculate the percentage reduce for the U-value. Given that the thermal conductivity of the insulation board is 0.025W/mK . (10 marks)
- Q2** (a) There are three main types of fan used for ventilation systems. Discuss the uses of these **three (3)** fans specifically on their efficiency and appropriate function.
- (i) Propeller fan
(ii) Centrifugal fan
(iii) Axial flow fan (6 marks)
- (b) There are four basic types of whole-house mechanical ventilation system. One of them is exhaust system that is suitable to be used in the kitchen. Sketch and explain the other **three (3)** basic types of mechanical ventilation systems. (15 marks)
- (c) What types of the systems mentioned in Q2(b) are suitable for hospital ventilation system and give your justification. (4 marks)
- Q3** (a) State **four (4)** differences between hydraulic elevators and electric traction elevator. (4 marks)
- (b) A 20 storey office block with floor height at 3m each, has a nett floor area above ground level of 9500m^2 and a population density is one person per 10m^2 of nett floor area. Based on Table Q(b)(i), Q(b)(ii), Q(b)(iii) and Q(b)(iv), calculate the flow rate, lift speed, minimum number of car and capacity. Determine the quality of service for the building if the population percentage at 5 min peak demand period is 17 percent. (6 marks)

- (c) (i) Define passive fire system and active fire system.
(ii) List down **three (3)** of fire hazard categories with example of suitable fire fighting agents for each category. (7 marks)
- (d) With the help of sketches, explain how the wet and dry riser works in fire hydrants system. (8 marks)

Q4 (a) Briefly explain the following electrical terms:

- (i) Current (I)
(ii) Voltage (V)
(iii) Resistance (R)
(iv) Power
(v) Energy

(10 marks)

(b) Suppose that two 100 watts lamp and two 200 watts lamp are connected in parallel into a 240 volt circuit. Calculate:

- (i) the current flow through each lamp, the total current in the circuit, and the total resistance of the circuit;
(ii) the total energy consumed in a year, and the cost of electrical energy for the year (based on RM1.10 per kWh).

Assuming that the lamps are used 8 hours per day and 250 days per year. All calculation steps shall be included in your answer.

(15 marks)

Q5 (a) As an consultant engineer, you are asked to design water storage tank, suction tank, and supply pipe for discharge of 1.25litres/sec, based on gravity supply for a hostel. The hostel are consists of three (3) blocks of building, each building have 100 rooms and 4 students in each room. Determine the total water requirement for hostel. Assume head loss is negligible, and length of pipe is 30m allow 20% for bends and other unforeseen. Assume 91 litres per person of cold water to cover 24 hours interruption of supply, and disruption of supply 12 hours.

(20 marks)

(b) Differentiate between water efficiency and water conservation? List **three (3)** water efficiency approaches for green building.

(5 marks)

TERJEMAHAN BAHASA MALAYSIA

- S1 (a) Bincangkan kepentingan Sistem Mekanikal dan Elektrikal untuk bangunan tinggi. Berikan sekurang-kurangnya **tiga (3)** alasan. (6 markah)
- (b) Terangkan proses pemindahan haba melalui pengaliran, perolakan dan radiasi. (9 markah)
- (c) Satu dinding rongga tidak berpenibat mempunyai nilai U iaitu $0.85\text{W/m}^2\text{K}$. Jika papan penibat ditambah dalam pembinaan, di mana ketebalan papan tersebut ialah 40mm, kira peratusan berkurang bagi nilai U. Diberi keberaliran termal bagi papan penibat ialah 0.025W/mK . (10 markah)
- S2 (a) Terdapat **tiga (3)** jenis kipas yang utama digunakan pada sistem pengudaraan. Bincangkan jenis-jenis kipas tersebut berkenaan kebolehnya dan fungsi.
- (i) Kipas pendorong
 - (ii) Kipas empar
 - (iii) Kipas aliran paksi
- (6 markah)
- (b) Terdapat 4 jenis sistem asas pengudaraan mekanikal yang boleh digunakan dalam bangunan. Salah satu daripadanya adalah sistem ekzos yang sesuai digunakan di kawasan dapur bagi kerja-kerja memasak. Lakar dan terangkan **tiga (3)** jenis asas sistem pengudaraan mekanikal yang lain. (15 markah)
- (c) Berdasarkan kepada 4 jenis system asas pengudaraan mekanikal dinyatakan pada S2(b), apakah sistem pengudaraan yang sesuai digunakan di hospital dan berikan justifikasi anda. (4 markah)
- S3 (a) Nyatakan **empat (4)** perbezaan di antara lif hidraulik dan lif daya tarikan elektrik. (4 markah)
- (b) Satu blok pejabat 20 tingkat dengan setiap tingkat mempunyai ketinggian 3m, keluasan lantai bersih di atas paras tanah adalah 9500m^2 dan kepadatan populasi ialah satu orang per 10m^2 daripada kawasan lantai bersih, Berpandukan Jadual Q(b)(i), Q(b)(ii), Q(b)(iii) and Q(b)(iv), hitung kadar aliran lif, kalajuan lif, bilangan minimum kereta lif dan kapasiti lif. Tentukan kualiti perkhidmatan lif bangunan, jika peratusan populasi pada waktu puncak permintaan 5 minit ialah 17 peratus. (6 Markah)

- (c) (i) Berikan definisi sistem kebakaran pasif dan sistem kebakaran aktif.
- (ii) Senaraikan **tiga (3)** daripada kategori bahan terbakar beserta contoh pemadam kebakaran yang bersesuaian untuk setiap kategori.
(7 markah)
- (d) Dengan bantuan lakaran, terangkan bagaimana penaik basah dan penaik kering berfungsi dalam sistem pili bomba.
(8 markah)
- S4 (a) Jelaskan secara ringkas terma-terma elektrik yang berikut:
- (i) Arus elektrik (I)
(ii) Voltan (V)
(iii) Rintangan (R)
(iv) Kuasa
(v) Tenaga
(10 markah)
- (b) Diandaikan dua lampu berkuasa 100 watt dan dua lampu berkuasa 200 watt disambung secara selari pada litar 240 volt. Kirakan:
- (i) aliran arus elektrik yang melalui setiap lampu, jumlah aliran arus elektrik dalam litar dan jumlah rintangan dalam litar;
- (ii) jumlah tenaga yang digunakan setahun dan kos penggunaan elektrik untuk setahun (berdasarkan RM1.10 per kWj).
- Dengan mengandaikan penggunaan lampu adalah 8 jam sehari selama 250 hari. Semua langkah-langkah pengiraan mestilah ditunjukkan dalam jawapan anda.
(15 markah)
- S5 (a) Sebagai seorang jurutera perunding, anda telah diminta untuk merekabentuk sebuah tangki simpanan air, tangki sedutan, dan paip bekalan untuk mengeluarkan air sebanyak 1.25liter/s, berdasarkan bekalan secara graviti untuk asrama. Asrama ini terdiri daripada tiga (3) blok bangunan, dan setiap bangunan mempunyai 100 bilik dan memuatkan 4 orang pelajar setiap bilik. Tentukan jumlah keperluan air untuk asrama ini. Andaikan kehilangan turus diabaikan, dan panjang paip adalah 30m dan dibenarkan 20% untuk bengkokkan dan lain-lain yang tidak tentu. Andaikan 91 liter per orang untuk bekalan air sejuk untuk menampung 24 jam gangguan bekalan, dan 12 jam gangguan bekalan.
(20 markah)
- (b) Bezakan antara kecekapan air dan pemuliharaan air? Senaraikan **tiga (3)** pendekatan kecekapan air untuk bangunan hijau.
(5 markah)

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TABLE Q3(b)(i): Lift Speed

Speed (m/s)	Lift travel in metres			
	Municipal flats	Luxury flats	Offices	Bed lifts
0.25–0.375	–	–	–	5
0.50	30	15	10	10
0.75	45	20	15	–
1.00	55	25	20	20
1.50	–	–	30	45
2.50	–	–	45	100
3.50	–	–	60	–
5.00	–	–	125	–

TABLE Q3(b)(ii): Handling capacity and interval

Passenger lift performance (based on 3.3 m floor-to-floor heights) and lifts serving all of 15 floors			Interval (s)		Handling capacity (persons)	
Number of cars	Speed (m/s)	12 passengers	16 passengers	20 passengers	24 passengers	
4	2.50	29	32	37	41	137
		103	112	127		
4	3.50		31	36	40	142
			116	132		
5	3.50		25	29	32	178
			146	165		
6	3.50			24	27	213
				198		

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TABLE Q3(b)(iii): Quality service of interval (s)

Interval (s)	Quality of service
25–35	Excellent
35–45	Acceptable for offices
60	Acceptable for hotels
90	Acceptable for flats

TABLE Q3(b)(iv): Number of lift

Minimum number of lifts for offices

Installation	Quality of service
One lift for every three floors	Excellent
One lift for every four floors	Average
One lift for every five floors	Below average

Note: A lower standard than the above would be acceptable for hotels and blocks of flats. Where large numbers of people have to be moved, cars smaller than twelve-person capacity are not satisfactory.

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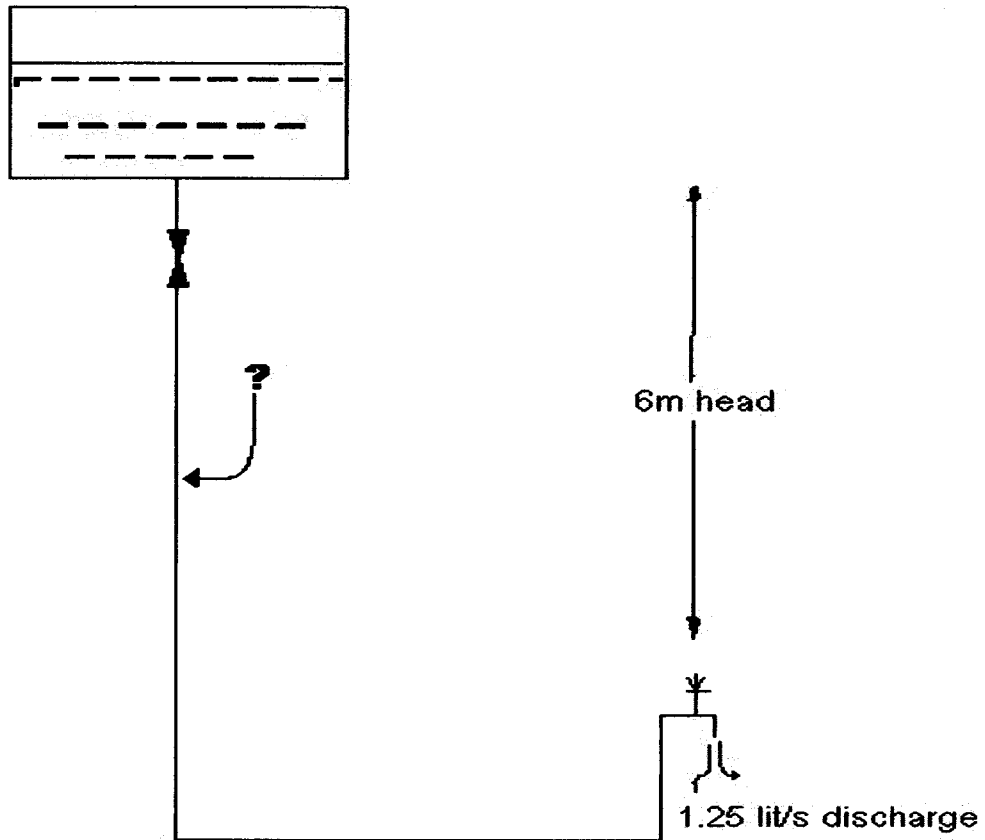


Figure Q5: Water Supply Diagram