



**UNIVERSITI TUN HUSSEIN ONN MALAYSIA**

**FINAL EXAMINATION  
SEMESTER I  
SESSION 2010/2011**

**COURSE NAME : BUILDING SERVICES II**  
**COURSE CODE : BFB 4073**  
**PROGRAMME : 4 BFB**  
**DURATION : 3 HOURS**  
**DATE OF EXAMINATION : NOVEMBER/DECEMBER 2010**  
**INSTRUCTION : ANSWER ALL QUESTIONS**

**THIS PAPER CONSISTS OF TEN(10) PAGES**

- Q1**
- (a) State **three (3)** advantages of utilizing the natural lighting in a building.  
(3 marks)
- (b) Explain how light shelves work as a natural lighting system for a building. You may use your own sketches to help your explanation.  
(7 marks)
- (c) A 30 meters x 20 meters size of floor area and 4 meters height space is designed as a general office. The interior designer decides to paint the ceiling with cream color whereas the walls are to be dark grey. The working plane of the office is at 0.90 meters from the floor level. Two 58 W 1500 mm fluorescent lamps are to be used with 5100 lumens of Lighting Design Lumen and 0.9 Maintenance Factor. Calculate the numbers of luminaries needed by referring to **Table Q1(a), Table Q1(b)** and **Table Q1(c)**.  
(15 marks)
- Q2** You are appointed as civil engineer for a hostel renovation project. The building is located besides a railway station and exposed to heavy noise pollution. Write a letter to your client advising on the renovation works to be done on the following items in order to isolate the building from its surrounding noise and vibration. Give your suggestion on each of the item. You may use sketches to help your suggestions.
- (a) Changing the 150mm thick brick wall facing the railway station.  
(8 marks)
- (b) Re-designing the sliding windows facing the railway station.  
(9 marks)
- (c) Surrounding landscape.  
(8 marks)

- Q3** (a) Briefly discuss the relationship between Sound Pressure Level (dB) and sound frequency (Hz).

(5 marks)

- (b) **Figure Q3** shows a Floor Plan of a room with a sliding door facing a beach. Two speakers Y and Z are placed at two different corners. At any point at a distance of 2 meters from Y, the Y sound level is measured 84 dB. At any point at a distance of 2 meters from Z, the Z sound level is measured 86 dB. While along 1 meter from the sliding door, the beach wave sound level is measured 65 dB. By referring to **Table Q3**, what are the sound level at the point as follows:

- i) Point A (2 meters from Y, 4 meters from Z and 4 meters from the sliding door)
- ii) Point B (4 meters from Y, 4 meters from Z and 2 meters from the sliding door)

(8 marks)

- (c) Room A, room B, room C, and room D are rooms that exposed to multi source of sound. By referring to **Table Q3**, what are the estimated noise level of each room based on their source of sound on the following conditions:

- i) Room A:
 

- Washing machine	85dB
- Drying machine	82dB
- Exhaust fan	78dB
- ii) Room B:
 

- Humming airconditioning	78dB
- Ringing phone	79dB
- Alarm clock	79dB
- iii) Room C:
 

- Baby's cry	64dB
- Air conditioning	59dB
- Toys	59dB
- iv) Room D:
 

- Generator	83dB
- Vacuum cleaner	78dB
- Alarm clock	79dB

(12 marks)

- Q4** (a) Briefly explain the connection between Reverberation Time and Total Room Absorption.

(5 marks)

- (b) The reverberation time of an auditorium is found to be too high. Discuss **five (5)** steps that you may suggest for the auditorium to reduce the reverberation time.

(20 marks)

- S1 (a) Nyatakan **tiga (3)** kebaikan menggunakan pencahayaan semulajadi di dalam bangunan.
- (3 markah)
- (b) Terangkan bagaimana *light shelves* bertindak sebagai sistem pencahayaan semulajadi untuk bangunan. Anda boleh gunakan lakaran untuk membantu penerangan anda..
- (7 markah)
- (c) Sebuah ruang berkeluasan 30 meter x 20 meter dan berketinggian 4 meter direkabentuk sebagai sebuah pejabat am. Perekabentuk dalaman memutuskan untuk menggunakan cat berwarna krim untuk siling ruang berkenaan. Dinding ruang tersebut pula menggunakan warna kelabu gelap. Aras kerja dalam ruang pejabat tersebut adalah pada ketinggian 0.9 meter dari aras lantai. Set kembar lampu *fluorescent* 58 W 1500 mm akan digunakan dengan 5100 lumens *Lighting Design Lumen* dan 0.9 *Maintenance Factor*. Kirakan bilangan set lampu yang diperlukan berpandukan **Jadual Q1(a), Jadual Q1(b) dan Jadual Q1(c)**.
- (25 markah)
- S2 Anda telah dilantik sebagai jurutera awam untuk kerja-kerja ubahsuaian bangunan asrama. Bangunan ini terletak bersebelahan dengan stesyen keretapi dan terdedah kepada pencemaran bunyi. Tuliskan sepucuk surat kepada klien anda bagi menasihatkan kerja-kerja yang perlu dilakukan terhadap item berikut untuk mengawal kesan bunyi bising dan getaran. Berikan cadangan anda untuk setiap item tersebut. Anda boleh menggunakan lakaran untuk membantu huraian cadangan anda.
- (a) Penukaran dinding bata setebal 150mm yang menghadap stesyen keretapi.
- (8 markah)
- (b) Merekabentuk semula tingkap gelungsur yang menghadap stesyen keretapi.
- (9 markah)
- (c) Landskap persekitaran.
- (8 markah)

- S3 (a) Bincangkan secara ringkas kaitan di antara *Sound Pressure Level* (dB) dan frekuensi bunyi (Hz).

(5 markah)

- (b) **Rajah Q3** menunjukkan Pelan Lantai sebuah bilik dengan pintu gelungsur yang menghadap pantai. Dua pembesar suara Y dan Z diletakkan di dua penjuru yang berbeza. Pada jarak 2 meter dari Y, bunyi yang dikeluarkan dari Y diukur pada aras 84 dB. Pada jarak 2 meter dari Z, bunyi yang dikeluarkan dari Z diukur pada aras 86 dB. Sementara sepanjang 1 meter dari pintu gelungsur, bunyi ombak berterusan diukur pada aras 65 dB. Dengan merujuk **Jadual Q3**, kirakan bacaan keseluruhan bunyi pada kedudukan seperti berikut:

- i) Titik A (2 meter dari Y, 4 meter dari Z dan 4 meter dari pintu gelungsur.)  
 ii) Titik B (4 meter dari Y, 4 meter dari Z dan 2 meter dari pintu gelungsur.)

(8 markah)

- iii) Bilik A, bilik B, bilik C dan bilik D adalah bilik-bilik yang terdedah kepada beberapa sumber bunyi. Dengan merujuk **Jadual Q3**, berapakah anggaran aras bunyi setiap bilik bagi keadaan berikut:

- i) Bilik A:  
 - Mesin basuh 85dB  
 - Mesin pengering 82dB  
 - Pembersih hampagas 78dB
- ii) Bilik B:  
 - Deruan penghawa dingin 78dB  
 - Telefon berdering 79dB  
 - Jam loceng 79dB
- iii) Bilik C:  
 - Tangisan bayi 64dB  
 - Penghawa Dingin 59dB  
 - Permainan 59dB
- iv) Bilik D:  
 - Generator 83dB  
 - Pembersih hampagas 78dB  
 - Jam loceng 79Db

(12 markah)

- Q4 (a) Terangkan secara ringkas kaitan di antara masa gema (*Reverberation Time*) dan jumlah penyerapan bilik (*Total Room Absorption*).

(5 markah)

- (b) Masa gema untuk sebuah dewan auditorium didapati terlalu tinggi. Bincangkan **lima (5)** langkah yang boleh anda lakukan untuk mengurangkan masa gema tersebut.

(20 markah)

**FINAL EXAMINATION**

SEMESTER/SESSION : SEMESTER I /2010/2011                      PROGRAMME : 4 BFB  
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**Table Q1(a): Typical value of illuminance**

<b>Application</b>	<b>Illuminance (lux)</b>
Emergency Lighting	0.2
Suburban street lighting	5
Dwelling	50 – 150
Corridors	100
General offices	400
Drawing office	600
Prolonged task with small detail	900

**Table Q1(b): Luminance factors for painted surfaces**

<b>Surfaces</b>	<b>Typical Colour</b>	<b>Luminance Factors</b>
Ceiling	White, Cream	70 – 80
Ceiling	Sky Blue	50 – 60
Ceiling	Light Brown	20 – 30
Walls	Light Stone	50 – 60
Walls	Dark Grey	20 – 30
Walls	Black	10
Floor		10



**FINAL EXAMINATION**

SEMESTER/SESSION : SEMESTER I /2009/2010  
 SUBJECT : BUILDING SERVICES II

COURSE : 4 BFB  
 SUBJECT CODE : BFB 4073

**Table Q1(c):**  
 Utilization factors for a bare fluorescent tube fitting with two 58 W 1500 mm lamps  
 (%)

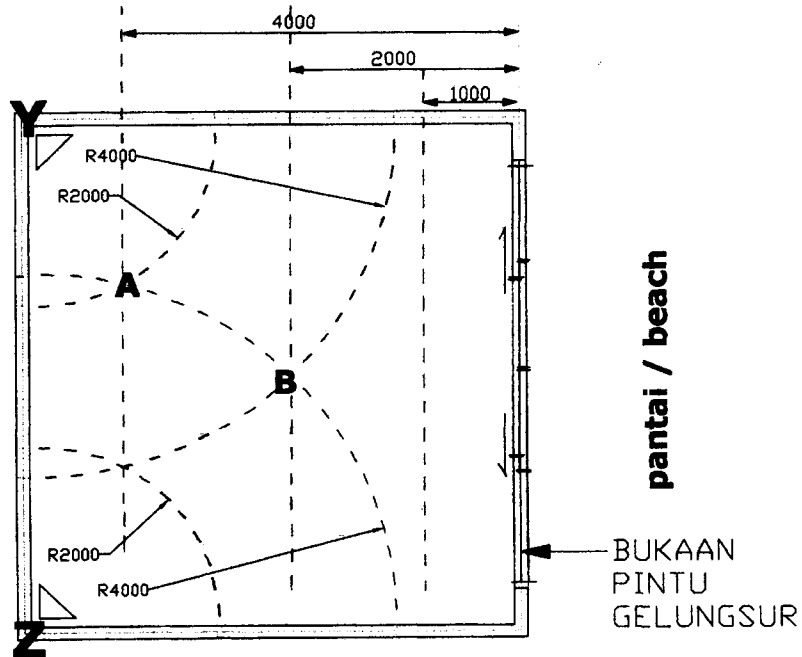
Luminance Factors		Room Index								
Ceiling	Wall	0.75	1.00	1.25	1.5	2.00	2.50	3.00	4.00	5.00
70	50	48	53	59	64	71	75	79	83	86
70	30	40	46	51	57	64	69	73	78	82
70	10	35	40	46	51	59	64	68	74	78
50	50	43	48	52	57	63	67	70	74	76
50	30	37	41	46	51	57	62	65	70	73
50	10	33	37	42	46	53	58	61	67	70
30	50	39	42	46	50	55	59	61	65	67
30	30	34	37	42	46	51	55	58	62	65
30	10	30	33	38	42	48	52	55	59	62

**FINAL EXAMINATION**

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COURSE : 4 BFB  
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**Figure Q3: Floor Plan of the Room**



**Table Q3: Additional of Sound Table**

