



UNIVERSITI TUN HUSSEIN ONN MALAYSIA

**FINAL EXAMINATION
SEMESTER I
SESSION 2009/2010**

SUBJECT NAME : BUILDING SERVICES II
SUBJECT CODE : BFB 4073
COURSE : 4 BFB
DURATION : 3 JAM
DATE : NOVEMBER 2009
INSTRUCTION : ANSWER ALL QUESTIONS

THIS PAPER CONSISTS NINE(9) PAGES

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- Q1** (a) Briefly discuss the difference sound loudness and sound frequency. (6 marks)
- (b) In normal atmosphere at room temperature, the velocity of sound is 340 meter/second. What is the wavelength of a sound with a complete cycle time (T) 0.008 second. (4 marks)
- (c) Room A, room B, room C, room D and room E are rooms that exposed to multi source of sound. By referring to **Table 1**, 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
 - v) Room E:
 - Public chatting 67dB
 - Fan 59dB
 - Alarm bell 72dB
- (15 marks)

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Q2 **Figure Q2** refers to a light source emitting a beam of light in the direction shown. The light source is 1 kW tungsten filament lamp. The luminous efficacy of the lamp is 18 lumens per watt. The efficiency of the luminaire optical system is 60 % and the solid angle of the beam is 0.8 steradian. From the data given:

- (a) Calculate the intensity (I) of the beam. (10 marks)
- (b) Calculate the horizontal illuminance (E). (10 marks)
- (c) Explain your opinion on the importance of lamp installation to be fixed focusing direct to the surface to be lighted. (5 marks)

Q3 (a) **Figure Q2** shows a cross section of an auditorium. As an acoustic consultant for the auditorium, you are expected to determine the best size of the sound reflector along with where it shall be placed. You are also expected to advise where the sound absorber shall be fixed at the rest of the wall. Draw up your suggestion. (10 marks)

- (b) As a restaurant operator, you are required to use tile finishing on the restaurant's floor and walls by the Health Department, so that they can easily be cleaned. Unfortunately by doing so, you realize that you are increasing the sound reverberation time of the restaurant dining hall, which make your customers uncomfortable. Discuss all the steps that you need to do to solve the problem. (15 marks)

Q4 A 30 meters x 10 meters size of floor area and 3 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 Q4(a)**, **Table Q4(b)** and **Table Q4(c)**. (25 marks)

TRANSLATION

- SI** (a) Bincangkan perbezaan di antara kekuatan bunyi dan frekuensi bunyi. (6 markah)
- (d) Di dalam ruang atmosfera biasa pada suhu bilik, kelajuan bunyi adalah pada kadar 340 meter/saat. Berapakah panjang gelombang bagi sesuatu bunyi yang melengkapkan satu kitaran gelombang (T) dalam masa 0.008 saat. (4 markah)
- (e) Bilik A, bilik B, bilik C, bilik D and bilik E adalah bilik-bilik yang terdedah kepada beberapa sumber bunyi. Dengan merujuk **Jadual Q1**, 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 |
| v) Bilik E: | |
| - Perbualan orang ramai | 67dB |
| - Deruan kipas angin | 59dB |
| - Loceng amaran | 72dB |
- (15 markah)

- S2** **Rajah Q2** menunjukkan sumber cahaya mengikut arah pancarannya. Sumber cahaya tersebut menggunakan lampu filamen tungsten 1 kW dengan kadar kilauan 18 *lumens/watt*. Kadar kecekapan sistem lampu pula ialah 60% dan sudut sebaran cahaya tersebut ialah 0.8 *steradian*. Berdasarkan data yang diberikan:
- (a) Kira keamatan cahaya (I) tersebut. (10 markah)
 - (b) Kira aras pencahayaan (E). (10 markah)
 - (c) Nyatakan pendapat anda tentang keperluan pemasangan sesuatu sumber cahaya dihalakan tepat ke permukaan yang ingin diteranginya. (5 markah)
- S3** (a) **Rajah Q3** menunjukkan keratan rentas sebuah auditorium. Sebagai seorang perunding akustik, anda diharapkan untuk membantu dalam menentukan saiz yang paling sesuai serta lokasi untuk pemasangan plat pembalik bunyi bagi ruang berkenaan. Anda juga diharapkan untuk memberikan nasihat perihal pemasangan penyerap bunyi bagi ruang tersebut. Beri cadangan anda dengan bantuan lakaran. (10 markah)
- (c) Sebagai seorang pengusaha restoran, anda diarahkan untuk memasang jubin pada lantai dan dinding restoran tersebut oleh pihak Jabatan Kesihatan. Ini adalah untuk memudahkan permukaan itu dibersihkan. Malangnya, anda menyedari dengan pemasangan jubin berkenaan anda telah meninggikan masa gema dalam ruang berkenaan yang menjadikan pelanggan anda tidak selesa. Bincangkan apakah langkah-langkah yang wajar anda lakukan untuk menyelesaikan masalah ini. (15 markah)
- S4** Sebuah ruang berkeluasan 30m x 10m dan berketinggian 3m 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 0.9m 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 Q4(a)**, **Jadual Q4(b)** dan **Jadual Q4(c)**. (25 markah)

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Figure Q1: Additional of sound table

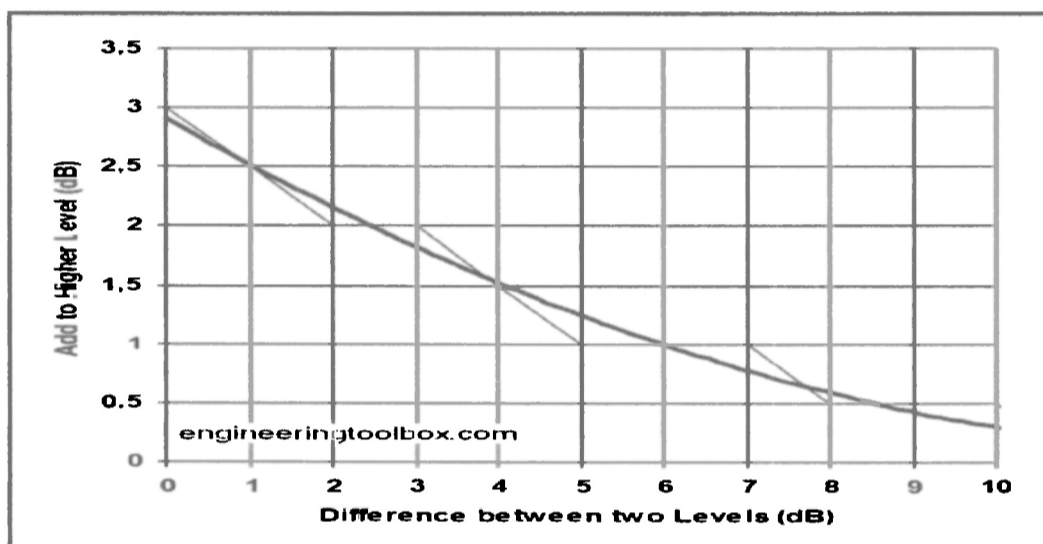
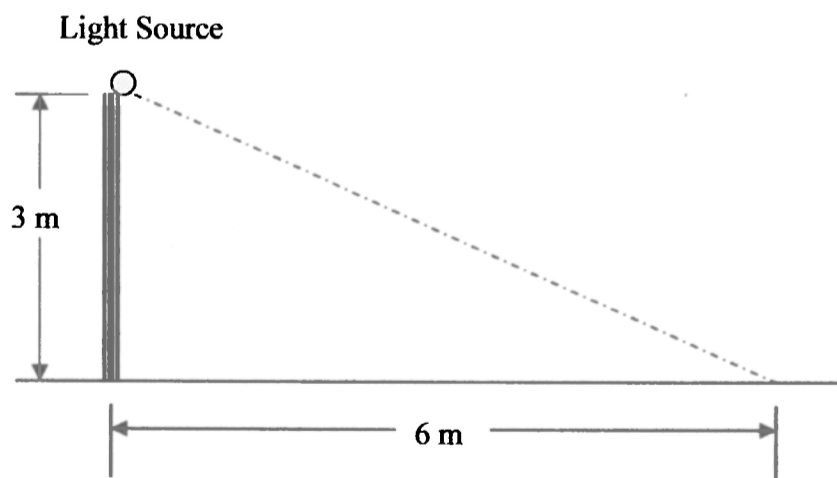


Figure Q2



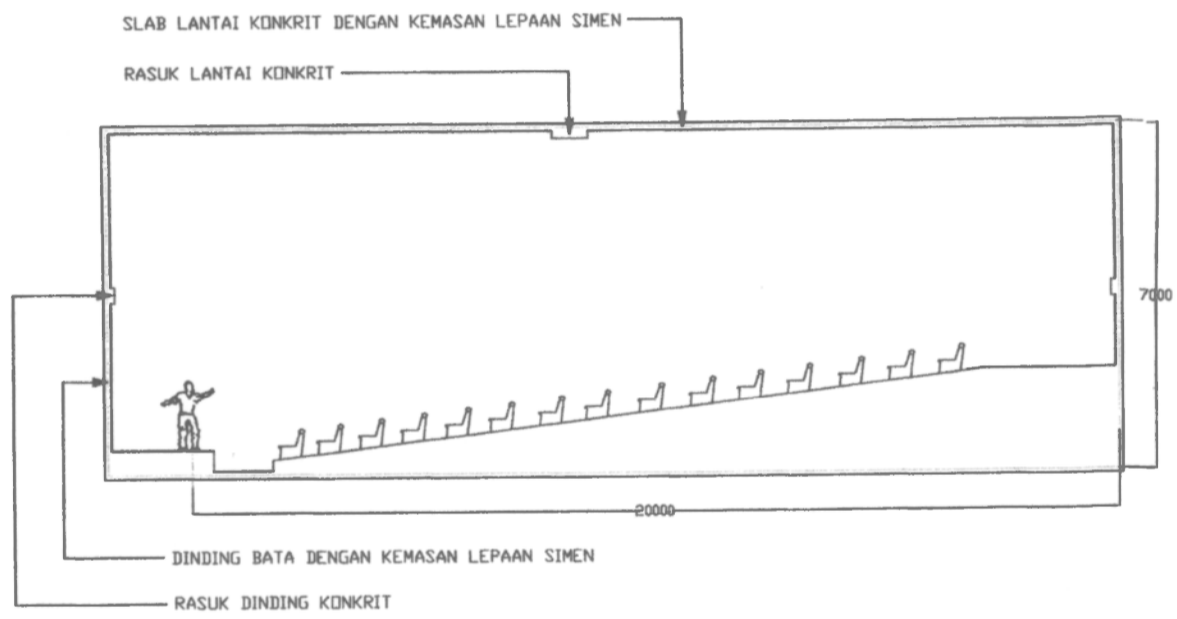
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Figure Q3: Auditorium cross section



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Table Q4(a): Typical value of illuminance

Application	Illuminance (lux)
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 Q4(b): Luminance factors for painted surfaces

Surfaces	Typical Colour	Luminance Factors
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

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Table Q4(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