



# **UNIVERSITI TUN HUSSEIN ONN MALAYSIA**

## **PEPERIKSAAN AKHIR SEMESTER II SESI 2008/2009**

**NAMA MATA  
PELAJARAN** : PERKHIDMATAN BANGUNAN II

**KOD MATA PELAJARAN** : BFB 4073

**KURSUS** : 4 BFF

**JANGKA MASA** : 3 JAM

**ARAHAN** : **JAWAB EMPAT (4) SOALAN SAHAJA  
DARIPADA LIMA SOALAN.**

**KERTAS SOALAN INI MENGANDUNGI SEMBILAN (9) MUKA SURAT BERCETAK**

- S1** Purata keseluruhan cahaya bagi sebuah bilik darjah berukuran 20' (lebar) x 40' (panjang) x 10' (tinggi) ialah 35 *foot candle*. Dengan menggunakan kaedah *Watts-per-square* dan **Jadual Q1**, kira:
- Jumlah kuasa pencahayaan yang diperlukan. (5 markah)
  - Bilangan lampu yang diperlukan; jika menggunakan lampu *fluoresen* berkembar 32watt, 1500mm panjang. Lakar lokasi kedudukan lampu-lampu tersebut. (15 markah)
  - Luas bilik darjah, jika jumlah kuasa pencahayaan yang digunakan adalah 2 kW. (5 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:
- Kira keamatan cahaya tersebut, I. (10 markah)
  - Kira aras pencahayaan, E. (10 markah)
  - Daripada *inverse-square law*, buktikan 
$$d\Omega = dA_1 / r_1^2 = dA_2 / r_2^2$$
  
$$= E_2 / E_1 = r_1^2 / r_2^2$$
 (5 markah)
- S3** (a) Sebuah kilang berukuran 20 m (lebar) x 40 m (panjang) x 8 m (tinggi). Kemas lantai kilang tersebut menggunakan konkrit. Dinding dan bumbung pula menggunakan *sheet metal decking*. Purata pekali serapan ialah 0.10. Anggarkan nilai *room constant* (R) dan masa gema (RT). (5 markah)
- (b) Berdasarkan manual daripada pengeluar kompresor Model A01, ia menyatakan mesin tersebut mempunyai purata aras kuasa bunyi 100 dB(A) sementara Model A02 pula 92 dB(A). Kedua-dua kompresor tersebut diletakkan bersebelahan. Apabila kedua-dua kompresor ini beroperasi, ia memberikan bacaan aras bunyi 87 dB(A) pada posisi pekerja. Dengan merujuk kepada **Rajah Q3(a)**, apakah aras bunyi yang mungkin dihasilkan oleh kompresor tersebut jika kompresor Model A02 dimatikan? (5 markah)

- (c) Sebuah kilang berukuran 30 m (lebar) x 42 m (panjang) x 8 m (tinggi) dibina menggunakan bumbung dan dinding daripada *sheet metal decking* dan berlantaikan konkrit ( $\alpha = 0.10$ ). Sebuah kipas dicadangkan untuk ditempatkan di penjuru hujung kilang tersebut ( $Q = 8$ ). Jarak terdekat kipas dengan posisi pekerja ialah 4 m. Aras bunyi semasa kilang tersebut ialah 88 dB(A). Aras kuasa bunyi yang dinyatakan dalam manual pengeluar pula ialah 99 dB(A). Dengan merujuk kepada **Rajah Q3(b)**, kirakan bacaan aras bunyi yang mungkin dicatatkan jika kipas tersebut beroperasi. (15 markah)
- S4 Sebuah ruang berkeluasan 30 meter x 10 meter dan berketinggian 3 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 Q4(a)**, **Jadual Q4(b)** dan **Jadual Q4(c)**. (25 markah)
- S5 Sebuah pejabat direkabentuk berukuran 30 meter x 10 meter dengan ketinggian 4 meter. Dua lampu kalimantan 58 W 1500 mm telah digunakan dengan kecekapan 65 lumen per watt. Kecekapan lampu ialah 60 % dan *solid angle* ialah 0.8 *steradian*. Permukaan kerja pula ialah 0.90 meter dari aras lantai. Kira tahap illuminasi (lux) pada:
- (a) Titik A, permukaan mendatar di bawah lampu. (5 markah)
- (b) Titik B, permukaan mendatar 2 m dari titik A. (10 markah)
- (c) Titik C, permukaan menegak, 3 m dari titik A. (10 markah)

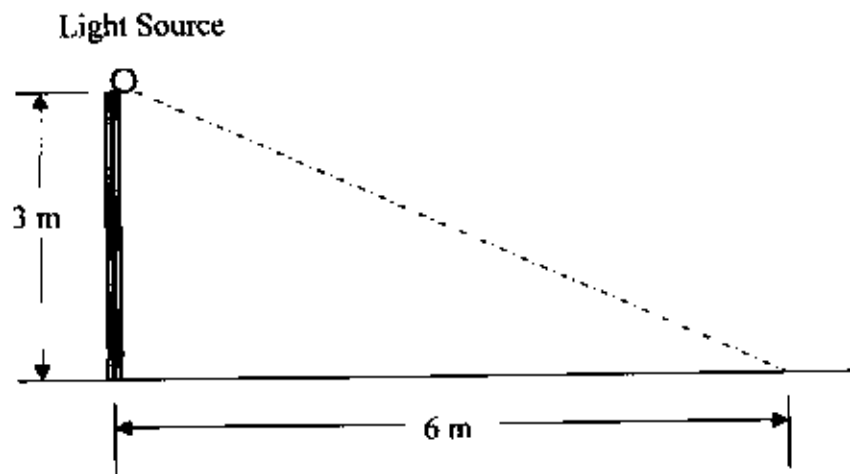
## TRANSLATION

- Q1** The average overall proper light for a 20 ft (width) x 40 ft (length) x 10 ft (high) classroom is about 35 foot candle. By using **Table Q1** and Watts-per-square method, calculate:
- (a) The total lighting power needed. (5 marks)
- (b) The total luminaires needed if using luminaires with two 32-watt, 1500 mm length fluorescent lamps each. Draw the location of the luminaires for the classroom. (15 marks)
- (c) The area of the classroom, if the total lighting power used is 2 kW. (5 marks)
- 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 of the beam, I. (10 marks)
- (b) Calculate the horizontal illuminance, E. (10 marks)
- (c) From the inverse-square law, derive  $d\Omega = dA_1 / r_1^2 = dA_2 / r_2^2$   
 $= E_2 / E_1 = r_1^2 / r_2^2$  (5 marks)
- Q3** (a) A factory space was measured as 20 m (width) x 40 m (length) x 8 m (high). Floor surfaces are concrete, with sheet metal decking for walls and roof and the average absorption coefficient given as 0.10. Estimate the room constant (R) and reverberation time (RT). (5 marks)
- (b) A manufacturer's data sheet shows that a compressor model A01 has an overall sound power level of 100 dB(A) and Model A02 an overall sound power level of 92 dB(A). The measured noise level at a worker's position with both compressors operating was 87 dB(A). The compressors are located together. By referring to **Figure Q3(a)**, what is the likely noise level at the worker's position if Model A02 is shut off? (5 marks)

- (c) A factory of dimension 42 m (length) x 30 m (width) x 8 m (high) was constructed with sheet metal decking roof and walls, and with a concrete floor ( $\alpha = 0.10$ ). A new exhaust fan is proposed to be located at the end corner of the factory ( $Q = 8$ ). The nearest workplace (receiver position) is 4 m away. The existing background noise level in the factory at this workplace is 88 dB(A). The fan sound power level is given in the manufacturer's data sheet as 99 dB(A). By referring to **Figure Q3(b)**, calculate the estimated noise level at this position when the fan becomes operational?  
(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)
- Q5** A 30 meters x 10 meters size of floor area and 4 meters height space is designed as a general office. Two 58 W 1500 mm fluorescent lamps are to be used with 65 lumen/watt efficacies. The efficiency of the luminaire optical system is 60 % and the solid angle of the beam is 0.8 steradian. The working plane of the office is at 0.90 meters from the floor level. Calculate the illumination level (lux) at:
- (a) Point A, horizontal surface under the luminaries. (5 marks)
- (b) Point B, horizontal surface 2 m from Point A. (10 marks)
- (c) Point C, vertical surface, 3 m from Point A. (10 marks)

**FINAL EXAMINATION**SEMESTER/SESSION : SEMESTER II /2008/2009  
SUBJECT : BUILDING SERVICES IICOURSE : 4 BFF  
SUBJECT CODE : BFB 4073**Table Q1**

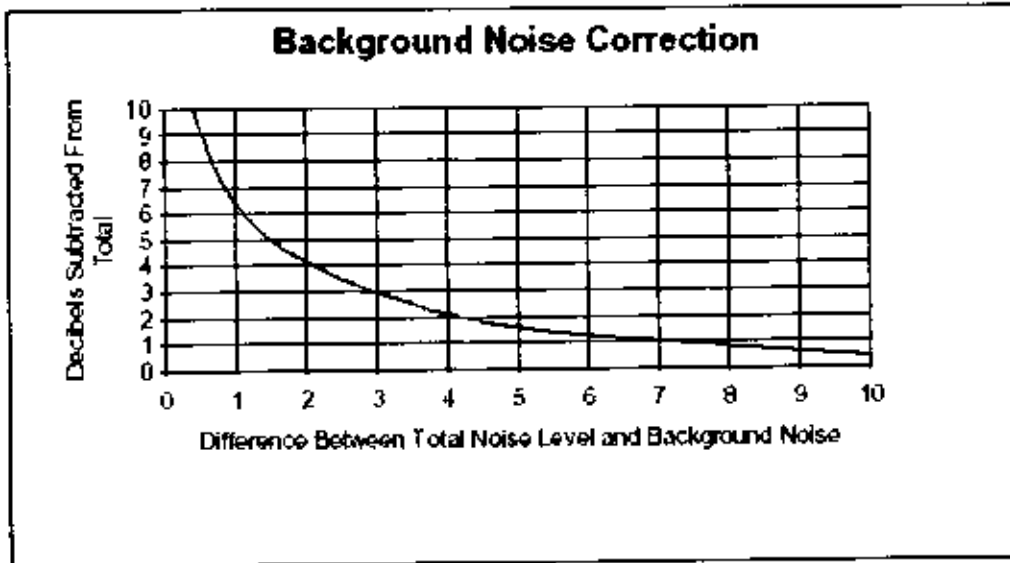
Average light level desired (fc)	Watts per square foot of fluorescent
5 - 10	0.2 - 0.4
10 - 20	0.4 - 0.8
20 - 50	0.8 - 1.2

**Figure Q 2**

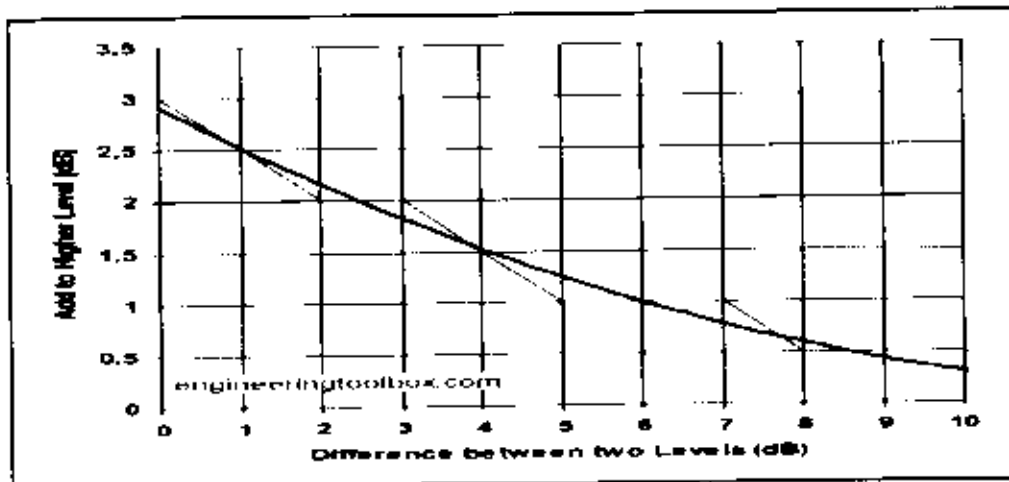
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**Figure Q 3(a)**



**Figure Q 3(b)**

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**Table Q4(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 Q4(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**

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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