

CONFIDENTIAL



UNIVERSITI TUN HUSSEIN ONN MALAYSIA

**FINAL EXAMINATION
SEMESTER II
SESI 2012/2013**

COURSE NAME : BUILDING SERVICES II
COURSE CODE : BFB 4073 / BFB 40703
PROGRAMME : 4 BFF
EXAMINATION DATE : JUNE 2013
DURATION : 3 HOURS
INSTRUCTION : ANSWER ALL QUESTIONS

THIS PAPER CONSISTS OF TEN (10) PAGES

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- Q1** (a) Define briefly:
- i) sound pressure
 - ii) sound wavelength
- (4 marks)
- (b) Differentiate between direct sound path and reflected sound path.
- (6 marks)
- (c) Please illustrate sound wave at various velocities.
- (4 marks)
- (d) Philharmonic Hall consist of three sound sources, which are from piano, violin and guitar. The total sound level for these three instruments is 120dB. When the sound from piano is turned off, the total sound level is 117dB. Violin and guitar contribute the same amount of sound level. Analyse the estimated sound level if violin is turned off while piano and guitar are turned on? Refer appendix.
- (6 marks)
- (e) Two recording studios in RTM Johor have a different level of reverberation time. The reading for studio A is 0.2s and for studio B is 2.0s. Please propose solutions for both studios to achieve 1.0s for their reverberation time.
- (5 marks)
- Q2** (a) Noise is an undesired sound or also known as a pollutant to the receiver. Its physical and emotional effects are difficult to define quantitatively but the noise level itself can be measured. It may consist of a single pure tone but in most cases contains many tones at different frequencies and intensities. List **four (4)** basic principles of noise control.
- (4 marks)
- (b) 'Anechoic chambers' are commonly used in acoustics to conduct experiments. Please provide further explanation on this term.
- (4 marks)
- (c) Mr. Raja is planning to develop a recording studio and workshop under one roof. The workshop is fully equipped with all the machines and tools beside his premise. He is very keen in appointing you as the Acoustic Consultant Engineer to design the studio. Demonstrate and illustrate to him all the characters of building and acoustic system that he needs to consider in order for him to get a good acoustic studio.
- (6 marks)

- (d) Differentiate between airborne noise and structure-borne noise. (4 marks)
- (e) Briefly explain **two (2)** steps to control an open space sound interruption. (4 marks)
- (f) Sound can be controlled to keep pleasure and harmonic condition. You are required to demonstrate and illustrate how a hall such as Philharmonic Hall in KLCC can apply the acoustical concept. (3 marks)
- Q3** (a) You are appointed by a client to design a lighting system for an office block in Damansara Damai. Propose and explain **four (4)** key strategies for energy-efficient lighting system. (12 marks)
- (b) What is a definition of daylight? (1 mark)
- (c) Large glazed areas may provide sufficient day lighting at some distance into the building. However, it does have some disadvantages. Explain **three (3)** disadvantages of using large windows for office buildings. (9 marks)
- (d) What are the strategies that can be done in improving the amount of light available, which come from a window? (3 marks)
- Q4** (a) A client requires advices in selecting two different lamp types, either fluorescent or incandescent light bulb to be used in his/her building. Please provide your suggestion and explanation on your suggestions, including its advantages and disadvantages. (10 marks)

- (b) The dimension of the drawing office is 17m x 12m and 3.5m high. This office has a white ceiling and light brown coloured walls. The working plane is 0.75m above the floor. New Streamlite double fluorescent lamp luminaries are selected to be used in this case. The assumption made for maintenance factor is 0.9. As an appointed engineer, please calculate the number of luminaries needed and determine the electrical consumption of the lighting system. The value for electric current for each luminaire is 100W. In addition, please estimate the maximum distance between luminaries if the spacing to height ratio (SHR) is 1.5. Refer appendix.

(15 marks)

-END OF QUESTION-

- S1 (a) Definasikan secara ringkas:
- i) tekanan bunyi
 - ii) gelombang bunyi
- (4 markah)
- (b) Terangkan perbezaan di antara “direct sound path” dan “reflected sound path”.
- (6 markah)
- (c) Lakarkan gelombang bunyi pada kelajuan yang berbeza?
- (4 markah)
- (d) Dewan Filharmonik mengandungi tiga sumber bunyi yang dihasilkan daripada piano, violin, dan gitar serta menghasilkan jumlah intensiti bunyi sebanyak 120dB. Apabila bunyi yang dihasilkan oleh piano dimatikan, jumlah intensiti bunyi bertukar menjadi 117dB. Intensiti bunyi bagi violin dan gitar adalah sama jumlahnya antara satu sama lain. Analisa aggaran intensiti bunyi ketika violin dimatikan manakala piano dan gitar dihidupkan?
- (6 markah)
- (e) Dua bilik rakaman di RTM Johor mempunyai bacaan “reverberation time” yang berbeza. Bilik A mencatatkan bacaan 0.2saat dan bilik B 2.0saat. Sarankan cara agar kedua-dua bilik berkenaan mendapat bacaan 1.0saat bagi bacaan “reverberation time” atau dikenali sebagai masa gema.
- (5 markah)
- S2 (a) Bunyi bising merupakan bunyi yang tidak dikehendaki dan boleh dikatakan sebagai pencemaran bunyi kepada pendengar. Ia juga sukar diukur secara kuantitatif akan sifat fizikal atau kesan emosi tetapi jumlah bunyi bising tersebut dapat diukur. Ia boleh mengandungi 1 ton atau banyak dengan berbeza frekuensi dan intensity. Senaraikan empat (4) prinsip asas pengawalan bunyi
- (4 markah)
- (b) “Anechoic chambers” selalu digunakan bagi menjalankan ujian akustik. Terangkan akan keadaan ini.
- (4 markah)
- (c) Mr. Raja telah membuat pilihan untuk membangunkan studio rakaman dan sebuah bengkel. Bengkel tersebut bersebelahan dengan studio rakaman dan dipenuhi dengan mesin dan alatan. Dia berbesar hati untuk melantik anda sebagai jurutera perunding dalam bidang akustik untuk merekabentuk bangunan-bangunan tersebut. Berikan gambaran dan ciri-ciri akustik yang perlu ada dalam mendapatkan prestasi bangunan yang terbaik.

(6 markah)

- (d) Nyatakan perbezaan di antara “airborne noise” dan “structure-borne noise”.
(4 markah)
- (e) Terangkan secara ringkas **dua (2)** cara mengatasi gangguan yang disebabkan oleh ruang terbuka.
(4 markah)
- (f) Bunyi boleh dikawal bagi mengekalkan keharmonian di sesuatu tempat. Anda dikehendaki menggambarkan bagaimana dewan seperti Filharmonik di KLCC dapat mengaplikasikan konsep akustik.
(3 markah)
- S3** (a) Anda dilantik oleh pihak klien untuk merekabentuk system pencahayaan bagi sebuah ruang pejabat di Damansara Damai. Cadang dan terangkan **empat (4)** strategi utama dalam mencapai pencahayaan menggunakan tenaga secara efisien.
(12 markah)
- (b) Apakah definisi bagi “daylight”?
(1 markah)
- (c) Permukaan berkaca yang luas mungkin dapat membekalkan cahaya ke dalam bangunan. Walau bagaimanapun, ia juga mempunyai beberapa kelemahan. Terangkan **tiga (3)** kelemahan menggunakan cermin yang besar bagi sesebuah bangunan pejabat.
(9 markah)
- (d) Bagaimanakah anda boleh meningkatkan jumlah cahaya yang masuk melalui tingkap ke dalam bangunan?
(3 markah)
- S4** (a) Seorang klien meminta nasihat anda dalam membuat pemilihan di antara dua jenis lampu, iaitu jenis “fluorescent” atau “incandescent light bulb” untuk digunakan dalam bangunan beliau. Berikan cadangan dan penerangan bagi pemilihan tersebut bersama kebaikan dan keburukan bagi jenis lampu yang dipilih.
(10 markah)
- b) Sebuah pejabat lukisan bersaiz 17m x 12m dan tinggi sebanyak 3.5m mempunyai siling berwarna putih dan dinding yang dicat dengan warna perang cair. Kawasan kerja adalah 0.75m dari aras lantai. Mentol jenis “Streamlite double fluorescent” yang baru telah dipilih untuk digunakan dalam kes ini.

Andaian yang dibuat bagi factor penyelenggaraan ialah 0.9. Sebagai seorang jurutera yang dilantik, kira jumlah pencahayaan yang diperlukan dan jumlah tenaga elektrik yang digunakan. Nilai arus elektrik bagi setiap mentol ialah 100W. Kemudian, anggarkan jarak maksimum di antara mentol jika nisbah jarak ke tinggi (SHR) ialah 1.5.

(15 markah)

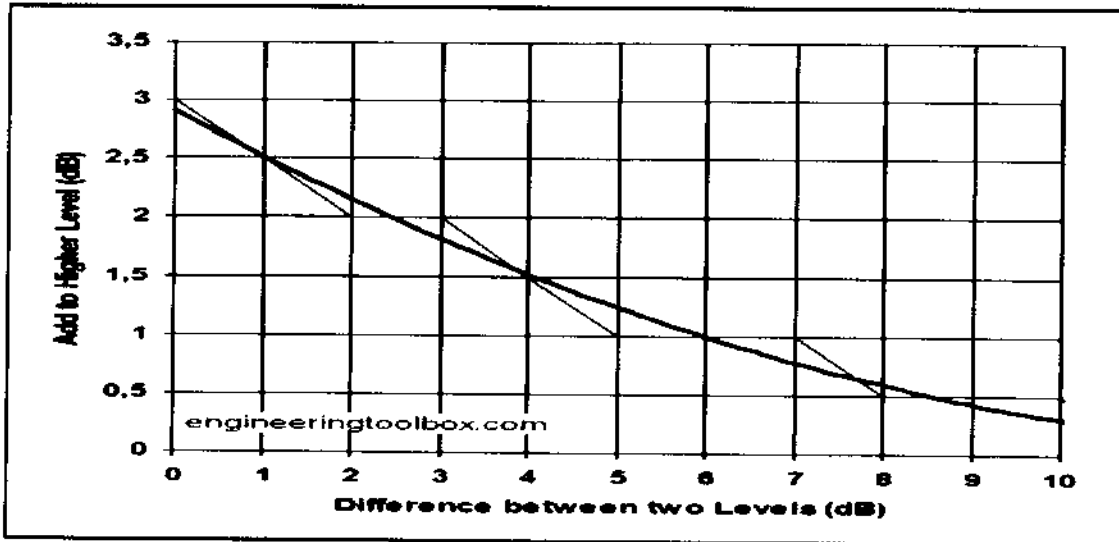
-SOALAN TAMAT-

APPENDIX

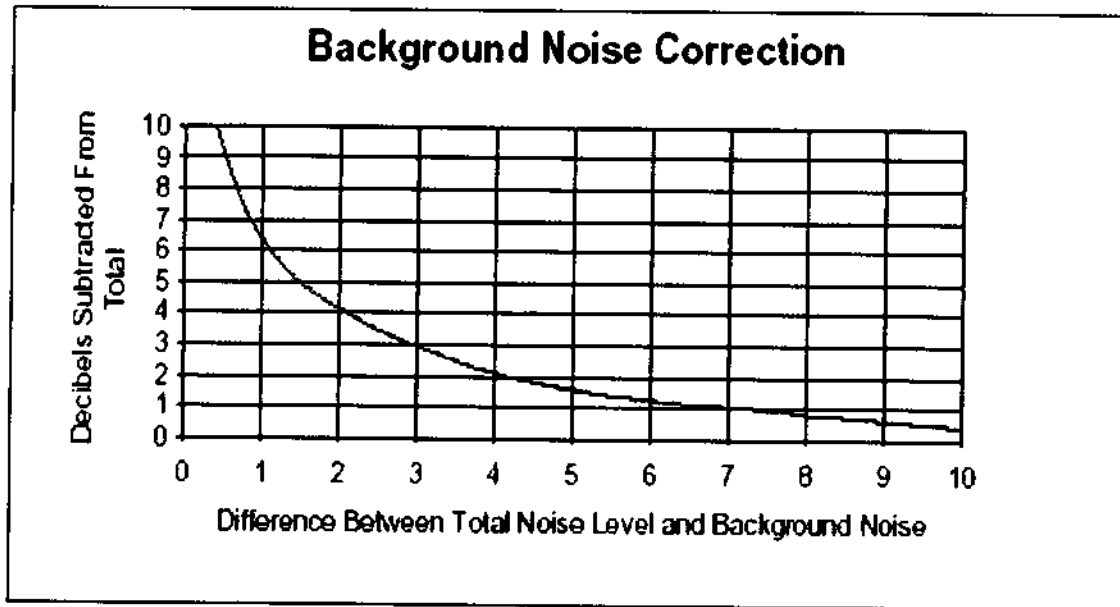
FINAL EXAMINATION

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Additional of Sound Table and Background Noise Correction



Background Noise Correction

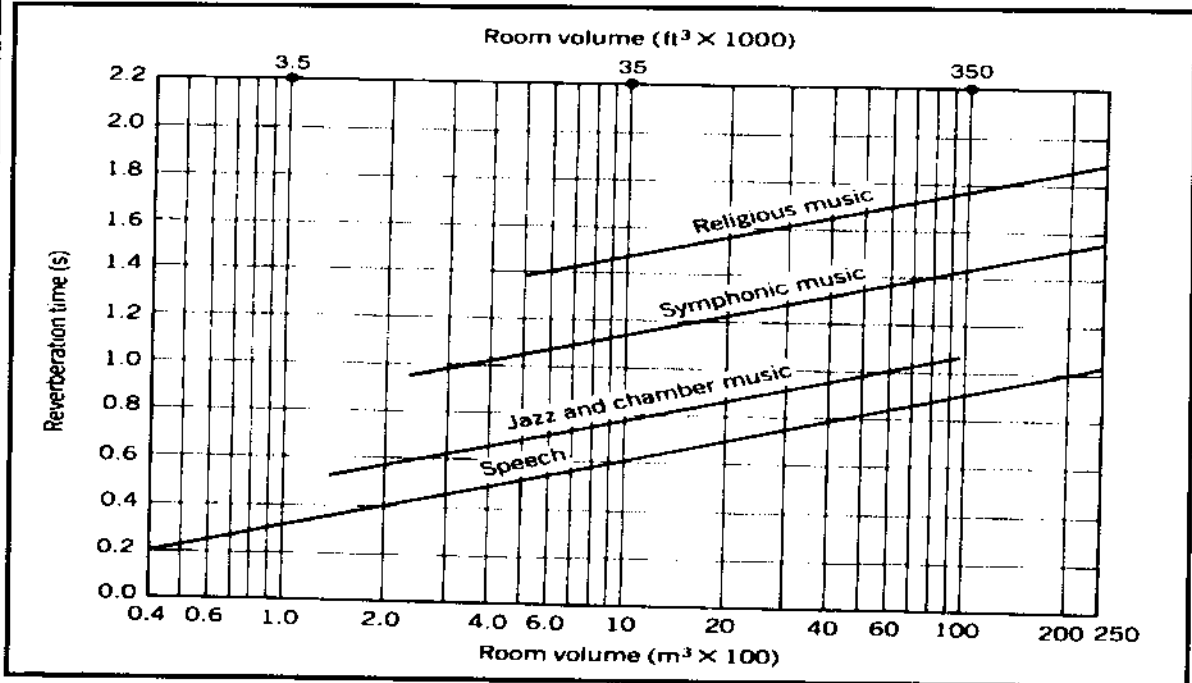


APPENDIX

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Additional of Reverberation Time Table



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

APPENDIX**FINAL EXAMINATION**

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Luminance factors for painted surfaces

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

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