

**CONFIDENTIAL**



**UNIVERSITI TUN HUSSEIN ONN MALAYSIA**

**FINAL EXAMINATION  
SEMESTER II  
SESSION 2014/2015**

COURSE NAME : ACOUSTIC AND LIGHTING  
COURSE CODE : BNB 40503  
PROGRAMME : 3 BNB  
EXAMINATION DATE : JUNE 2015 / JULY 2015  
DURATION : 3 HOURS  
INSTRUCTION : ANSWER **FOUR (4)** QUESTIONS ONLY

THIS QUESTIONS PAPER CONSISTS OF **SIX (6)** PAGES

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- Q1**
- (a) Identify **SIX (6)** behaviors of sound. (6 marks)
  - (b) Describe sound propagation through indoor air. (4 marks)
  - (c) Briefly describe the relationship between sound power and sound pressure. Provide an example and formulas. (6 marks)
  - (d) The speed of sound in the air, water and steel are 331 m/s, 1410 m/s and 5000 m/s. Sketch the sound wave frequency through air, water and steel. Justify your reason, why these frequency waves are dissimilar for each medium through which it passes. (9 marks)

**Q2** Mr. Ahmad 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 to design the studio. You are required to prepare a proposal plan on acoustic purposes. Mr. Ahmad needs your briefing on the following items:

- (a) The effect of reverberation time in the studio. (4 marks)
- (b) Differentiate between air borne sound and structure borne sound due to machines and tools. (8 marks)
- (c) With an illustration, recommend practical noise control to reduce the noise level in the studio. (8 marks)
- (d) Suggest **FIVE (5)** suitable sound insulation materials. (5 marks)

- Q3** (a) Differentiate between anechoic chamber and semi-anechoic chamber. (5 marks)
- (b) Interpreted with sketches the mechanism by anechoic chamber (using 2D wedges) to minimize the reflection of sound waves impinging onto the walls. (10 marks)
- (c) “Pyramidal RAM is at its most absorptive when the incident wave is at normal incidence to the internal chamber surface”. Analyze this statement by using formula on effectiveness over frequency. (10 marks)
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- Q4** A general office size 20 m x 10 m x 3.5 m height has a sky blue ceiling and light stone colour walls. The working table is 0.75 m above the floor. Given spacing to height ratio (SHR) is 1.5. New double T6 circular fluorescent lamps with 100 W are to be used. By referring Table Q4 (i) to (iii) and using Lumen Design Method:
- (a) Calculate the numbers of luminaires needed. (12 marks)
- (b) Estimate the electrical power consumption for a month, if the usage remains 8 hours/day with the new tariff 21.8 cent/kWh. (5 marks)
- (c) Examine the maximum distance for each luminaires. (5 marks)
- (d) From the calculation, sketch the design layout of light fittings for this office. (3 marks)

- Q5**
- (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 comparison and explanation on your suggestions, including its advantages and disadvantages. (8 marks)
  - (b) With an illustration, proposed **FOUR (4)** types of building design to maximize the daylighting. (8 marks)
  - (c) Discuss light tubes application in high rise building. (6 marks)
  - (d) In your opinion, why good indoor lighting design are more important? (3 marks)

- END OF QUESTION -

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**Table Q4 (i) Typical value of illuminance**

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

**Table Q4 (ii) Luminance factors for painted surfaces**

<b>Surfaces</b>	<b>Typical color</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



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**Table Q4 (iii) Utilization Factors**

<b>Luminance Factors</b>		<b>Room Index</b>								
<b>Ceiling</b>	<b>Wall</b>	<b>0.75</b>	<b>1.00</b>	<b>1.25</b>	<b>1.5</b>	<b>2.00</b>	<b>2.50</b>	<b>3.00</b>	<b>4.00</b>	<b>5.00</b>
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