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UNIVERSITI TUN HUSSEIN ONN MALAYSIA

**FINAL EXAM
(ONLINE)
SEMESTER 2
SESSION 2020/2021**

COURSE NAME: ACOUSTIC AND NOISE CONTROL
COURSE CODE: BDC 40803
PROGRAMME: BDD
EXAMINATION DATE: JULY 2021
DURATION: 3 HOURS
INSTRUCTIONS: ANSWERS FIVE (5) OUT OF SIX (6)
QUESTIONS

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THIS QUESTION PAPER CONSISTS OF EIGHT (8) PAGES

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Q1 (a) Three (3) of omnidirectional sound source which is uncorrelated **A**, **B** and **C** are to be placed at three corners of a square as shown in **Figure Q1(a)**. The independent calibration tests on these sources showed that they produced the following amounts of acoustic power in **Table Q1(a)**. Use **Table Q1(b)** to get value *a* to *c*

i. If a microphone is located opposite of source **B** with distance (*r*) is 10 m, examine the sound pressure level (*L_p*) at point **D** by assuming the type of sound source in sound power level (*L_w*) of **A**, **B** and **C** are far field type.

(6 marks)

ii. The inverse law '*6dB per doubling of distance*' is related to sound intensity (*I*) and distance (*r*) which need more than one measurement locations. By referring the equations below, discuss why two (2) locations are needed to get *L₂*.

$$I_2 = I_1 \left(\frac{r_1}{r_2}\right)^2$$

$$L_2 = L_1 - 20 \log \left(\frac{r_2}{r_1}\right)$$

(4 marks)

Table Q1(a)

Source A : (a + 10) watts
 Source B : (b + 20) watts
 Source C : (c + 15) watts

Table Q1(b)

MATRICK NO	C	D	0	9	4	6	5	0
	x	x	x	x	x	a	b	c

*Note: *a* to *c* is the Student Matric Number.

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(b) The sound pressure levels from **six** (6) noise sources are measured individually at several point of machines in a workshop and their (logarithmic) average sound pressure level (L_{avg}) is A dB. However, only five of sources are reported by a technician. The report is shown in **Table Q1(c)**. Use **Table Q1(d)** to get value a to f .

i. Determine the sound pressure level produce by the sixth source. (5 marks)

ii. Give your evaluation and percentage increasing on sound pressure level between (L_p) **four** (4) sources (from source 1 to 4) and **six** (6) sources. (5 marks)

Table Q1(c)

L_{avg}	A= (a+80) dB
Source 1	B= (b+70) dB
Source 2	C= (c+70) dB
Source 3	D= (d+70) dB
Source 4	E = (e+70) dB
Source 5	F = (f+80) dB

Table Q1(d)

MARTIC ID	C	D	0	9	4	6	5	0
	x	x	a	b	c	d	e	f

*Note: a to f is the Student Matric Number.

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Q4 You are an engineer who is working in an international company. Your manager requested that he conduct a noise assessment at the production workshop line due to the noisy machinery.

(a) Describe the sources of error that could affect noise level measurements made by sound level meter and how to minimize the effects of wind noise.

(8 marks)

(b) If noise measurements are being taken in support of a legal case, distinguish why would you use a sound level meter on site, rather than a tape recording which you could analyze at your leisure?

(4 marks)

(c) Compute the L_{Aeq} of a noise as shown in **Table Q4(a)**. Use **Table Q4(2)** to get value a to e .

Table Q4(a)

Time	L_p
(a+10) minutes	(a+70) dB
(b+2) hours	(b+90) dB
(c+2) hours	(c+90) dB
(d+2) hours	(d+70) dB
(e+20) minutes	(e+80) dB

Table Q4(b)

MARTICID	C	D	0	9	4	6	5	0
	x	x	a	b	c	d	e	f

*Note: a to e is the Student Matric Number.

(4 marks)

(d) Describe why the L_{Aeq} the generally used for level of a time. (C2)

(4 marks)

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Q5 A genset dimensions are $(a+50)$ m x $(b+50)$ m x $(c+5)$ m emits a sound power level of 130 dB in the 500 Hz octave band. The machine is located in the centre of the factory mid-way between the floor and ceiling. Use **Table Q5(a)** to get value a to f .

(a) If you have investigated the value of direct and reverberant sound pressure levels at $(d+5)$ m from the acoustic centre of the machine. Previous measurement the genset is radiated uniformly in all directions with the room has a specular reflecting floor, wall and ceiling which is absorbent characteristic of 0.5. Assess the sound level which is direct and reverberant sound pressure at position $(d+5)$ m from the acoustic centre of the genset.

(7 marks)

(b) If the factory dimension were $(d+10)$ m x $(e+10)$ m x $(f+5)$ m and the pressure reflection coefficient amplitude for all surfaces was 0.7, examine the total sound pressure level if the distance is $(d+7)$ m from the acoustic centre of the genset. Comment the difference.

(6 marks)

(c) For the case in part (a) and (b), calculate distance from the genset would the direct and reverberant fields be equal. Comment the differences between both part (a) and (b) regarding to their findings.

(7 marks)

Table Q5(a)

MARTICID	C	D	O	9	4	6	5	0
	x	x	a	b	c	d	e	f

*Note: Use a to f is the Student Matric Number

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Q6 (a) Diagnosis has shown that in factory XYZ has a particular case sound from the source reaches the receiver via three paths equally which the level at the receiver is $(d+70)$ dB. Three different noise control treatments are available to reduce sound transmission via three paths by $(e+20)$ dB. Use **Table Q6(a)** to get value a to f .

i. Examine the noise level (dB) at the receiver be reduced if use one treatment panel and two treatments panel.

(7 marks)

ii. Instead of treating the three paths there is an alternative treatment which by reducing the source level $(f+20)$ dB, calculate the level at the receiver.

(2 marks)

iii. Comment what is your general conclusion can you made on noise control process.

(6 marks)

(b) Air enters a room through a single grille situated in one of the top corners of the room. A target level of NR 35, shown in **Figure Q6(b)**, has to be achieved by the ventilation system, which consists of a fan connected to the main duct of length $(a+5)$ m. The airflow then split into two equal parts, one of the branches of length $(b+3)$ m serving the room in question via the single grille. There is one bend in the central duct before the airflow division and one bend in each of the branches.

Evaluate the extra attenuation required in the 250 Hz octave band to meet the NR 35 target at point in the room $(c+4)$ m from the grille, given the following information in **Table Q6(b)**, all of which refers to the 250 Hz octave band. Use **Table Q6(a)** to get value a to f .

(5 marks)

Table Q6(a)

MARTIC ID	C	D	0	9	4	6	5	0
	x	x	a	b	c	d	e	f

*Note: a to f is the Student Matric Number.

Table Q6(b)

Sound power level of fan	$(c+80)$ dB
Attenuation of main conduct	0.3dB/m
Attenuation of branch duct	0.5 dB/m
Attenuation of bend in main duct	$(d+6)$ dB
Attenuation of bend in branch duct	$(e+3)$ dB
Room constant	50m ²
reflection of grille	$(f+4)$ dB

-END OF QUESTION-



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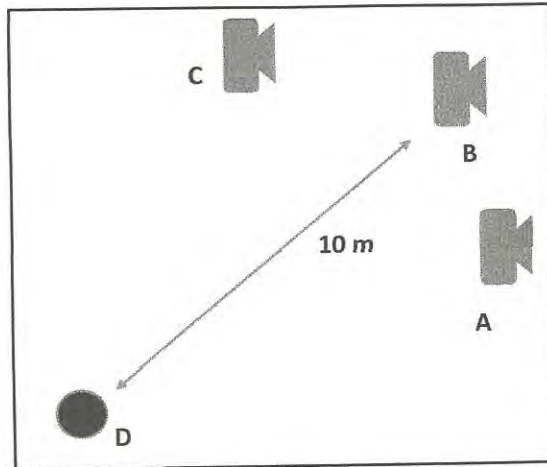


Figure Q1(a)

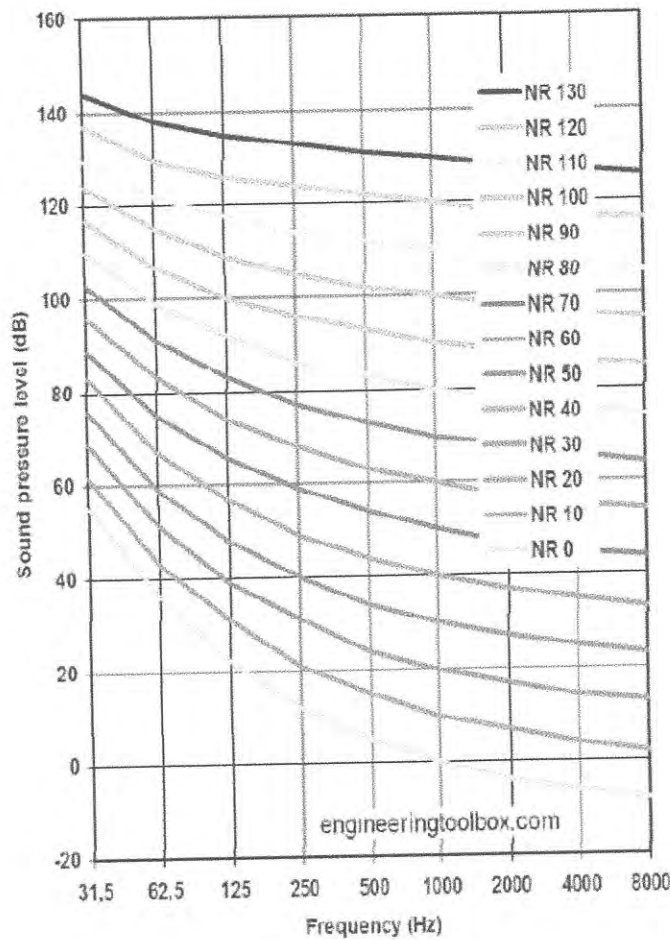


Figure Q6(b)