UNIVERSITI SAINS MALAYSIA

Second Semester Examination
2016/2017 Academic Session

June 2017

EAP412 – Environmental Studies
[Pengajian Alam Sekitar]

Duration : 3 hours
[Masa :3 jam]

Please check that this examination paper consists of **NINE (9)** pages of printed materials including appendix before you begin the examination.
*[Sila pastikan kertas peperiksaan ini mengandungi **SEMBILAN (9)** muka surat bercetak termasuk lampiran sebelum anda memulakan peperiksaan ini.]*

Instructions: This paper consists of **SIX (6)** questions. Answer **FIVE (5)** questions only.
*[Arahan: Kertas ini mengandungi **ENAM (6)** soalan. Jawab **LIMA (5)** soalan sahaja.*

All questions **MUST BE** answered on a new page.
*[Semua soalan **MESTILAH** dijawab pada muka surat baru.]*

Write the answered question numbers on the cover sheet of the answer script.
Tuliskan nombor soalan yang dijawab di kulit luar buku jawapan anda.

You may answer the question either in Bahasa Malaysia or English.
[Anda dibenarkan menjawab soalan sama ada dalam Bahasa Malaysia atau Bahasa Inggeris.]

In the event of any discrepancies, the English version shall be used.
[Sekiranya terdapat percanggahan pada soalan peperiksaan, versi Bahasa Inggeris hendaklah diguna pakai.]

1. Briefly discuss the category of usage under 53CFR40 USEPA in measurement of air pollutants and give a suitable example for each category.

Bincangkan kategori penggunaan dibawah 53CFR40 USEPA dalam pengukuran pencemar udara dan berikan contoh yang sesuai untuk setiap satu kategori tersebut.

[20 marks/*markah*]

2. [a] **Figure 1** shows one of plume type released from a stack. Name and explain this type of plume with regards to atmospheric stability.

Rajah 1 *menunjukkan satu daripada jenis kepulan asap dari serombong. Namakan dan terangkan jenis kepulan ini berdasarkan kestabilan atmosfera.*

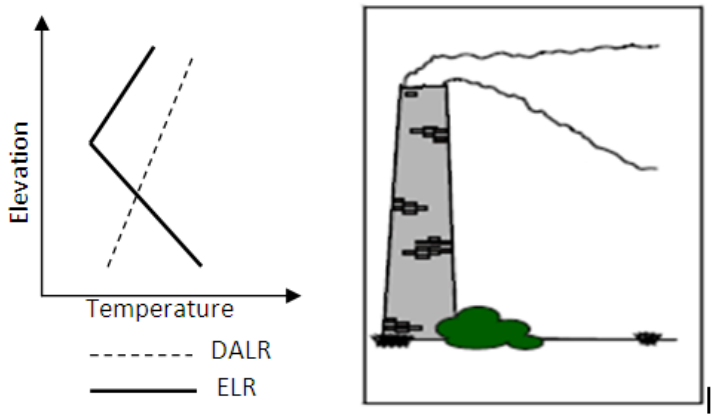

Figure 1/*Rajah 1*

[10 marks/*markah*]

[b] An industrial boiler is burning at 12 tonne/h of 1.6% nitrogen. Stack height (h) is 100 m and plume rise (dh) is 20 m, wind speed at 10 m is 2.31 m/s. It is one hour before sunrise, and the sky is clear. Calculate the maximum NO_2 concentration 2 km downwind of the source at ground level on flat terrain.

Dandang industri membakar pada 12 tan/j pada 1.6% nitrogen. Ketinggian serombong (h) adalah 100 m dan kenaikan kepulan (dh) adalah 20 m, kelajuan angin pada 10 m adalah 2.31 m/s. Ianya adalah satu jam sebelum matahari terbit, dan langit adalah tidak berawan. Kirakan kepekatan maksimum NO_2 di bawah tiupan angin pada jarak 2 km daripada sumber pada paras bumi di kawasan yang rata.

[10 marks/*markah*]

3. [a] Describe the main classes of clinical waste and explain appropriate management methods for each class.

Jelaskan kelas-kelas utama sisa klinikal dan terangkan kaedah pengurusan yang sesuai untuk setiap kelas tersebut.

[10 marks/*markah*]

[b] A mineral processing industry owned by a local company has been producing scheduled waste byproducts which must be sent for disposal at Bukit Nenas secured landfill. Propose the procedure to be implemented for transporting the materials to the disposal site.

Sebuah industri memproses mineral yang dimiliki oleh syarikat tempatan telah menghasilkan sisa terjadual sampingan yang perlu dihantar untuk dilupuskan di tapak pelupusan selamat Bukit Nenas. Cadangkan prosedur yang perlu dilaksanakan bagi penghantaran bahan berkenaan ke tapak pelupusan.

[10 marks/*markah*]

4. [a] A majority of palm oil mills still rely on the conventional ponding system for the treatment of its effluent. Describe **TWO (2)** effluent ponds that are required after the anaerobic pond in the palm oil mill effluent treatment system.

*Majoriti kilang minyak sawit masih bergantung kepada sistem takungan konvensional untuk rawatan efluen. Terangkan **DUA (2)** kolam efluen yang diperlukan selepas kolam anaerobik dalam sistem rawatan efluen kilang minyak sawit.*

[6 marks/*markah*]

[b] The treatment of scheduled and clinical waste in northern Malaysia involves the burning of wastes in an incinerator at Kamunting, Perak.

Rawatan sisa terjadual dan klinikal di utara Malaysia membabitkan pembakaran bahan buangan dalam penunu di Kamunting, Perak.

[i] Give **TWO (2)** types of incinerator along with the size commonly used for the treatment of clinical waste.

*Berikan **DUA (2)** jenis penunu bersama-sama dengan saiz yang biasa digunakan untuk rawatan sisa klinikal.*

[2 marks/*markah*]

[ii] Describe **THREE (3)** factors influencing the completeness of combustion.

*Huraikan **TIGA (3)** faktor mempengaruhi kesempurnaan pembakaran.*

[6 marks/*markah*]

[iii] Discuss the requirement of a two stage combustion system in an incinerator.

Bincangkan keperluan pembakaran sistem dua peringkat dalam penunu.

[6 marks/*markah*]

5. [a] With the help of a sketch diagram, define and describe 'short wave' and 'long wave' in relation to their wavelength and frequency.

Dengan bantuan lakaran kasar, definisi dan terangkan 'gelombang pendek' dan 'gelombang panjang' yang berkaitan dengan jarak gelombang dan frekuensinya.

[6 marks/*markah*]

[b] Calculate the speed of a sound that travels at a frequency of 9,000 cycles/second with wavelength of 0.3 m.

Kirakan kelajuan bunyi yang bergerak pada frekuensi 9,000 pusingan/saat dengan jarak gelombang 0.3 m.

[5 marks/*markah*]

[c] The following ideal noise levels in dB (A) were generated separately in a control room: 67, 85, 73, 80, 77. If all the noise sources are mixed at the same time, calculate the composite Sound Pressure Level (Lp) that will be heard. Comment your answer.

Paras bunyi ideal berikut dalam dB (A) dijana secara berasignan dalam bilik kawalan: 67, 85, 73, 80, 77. Sekiranya kesemua sumber bunyi ini digabungkan pada masa yang sama, kirakan Paras Tekanan Bunyi (Lp) komposit yang bakal didengari. Komen jawapan anda.

[9 marks/*markah*]

6. [a] There are many types of noise analyses. Define 'Phone' and state one of its applications in civil engineering.

Terdapat berbagai jenis analisis bunyi. Definisikan 'Phon' dan nyatakan satu dari aplikasinya dalam kejuruteraan awam.

[5 marks/*markah*]

[b] Using the Equivalent Noise Level Contour given in **Figure 1**, determine the noise level in dB at 100 Hz, if its level at the referenced frequency is 70 dB (70 Phone). Comment your answer.

*Menggunakan Kontor Paras Bunyi Setara dalam **Rajah 1**, tentukan paras bunyinya dalam dB pada 100 Hz, jika parasnya pada frekuensi rujukan standard adalah 70 dB (70 Phon). Komen jawapan anda.*

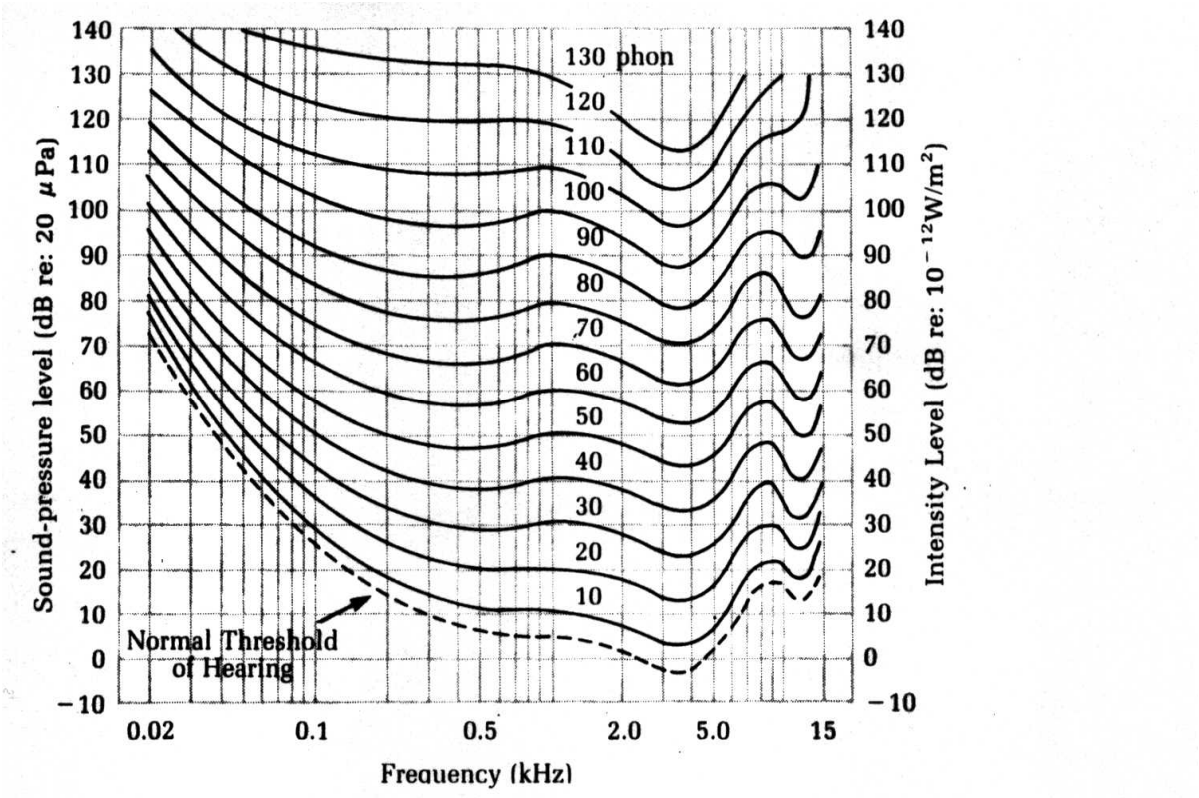

Figure 1: Fletcher & Munson Equivalent Noise Level Contour

Rajah 1: Kontor Paras Bunyi Setara Fletcher & Munson

[6 marks/*markah*]

[c] Determine the $L_{eq\ (1\ hr)}$ from the following noise monitoring data.

Tentukan nilai $L_{eq\ (1\ jam)}$ dari data pemantauan bunyi berikut:

Time (s) *Masa (s)*	dB (A)
10	84
20	80
30	74
40	75
50	74
60	71
70	75
80	74
90	78
100	84

[5 marks/*markah*]

[d] There are many methods that could be implemented to control noise at transmission line. With the help of a sketch diagram, discuss the effectiveness of a short vertical concrete barrier in reducing the low frequency noise.

Terdapat berbagai kaedah yang boleh dilaksanakan dalam mengawal bunyi di laluan penghantaran. Dengan bantuan lakaran, bincangkan keberkesanan penghalang konkrit pugak pendek dalam mengurangkan bunyi frekuensi rendah.

[4 marks/*markah*]

APPENDIX/*LAMPIRAN*

Useful formulae:

1) $C = 20.05\ T^{0.5}$

2) $I = w/s$

3) $L_I = 10 \log_{10} I/10^{-12}$

4) $Lp = 20 \log_{10} (P/Po)$, $Po = 20\ \mu Pa$

5) $Lw = 10 \log_{10} (w/10^{-12})$

6) $Leq = 10 \log_{10} \sum ti\ 10^{\ Li/10}$

7) $L_{wp} = 10 \log_{10} 1/N \sum 10^{\ (Lj/10)}$

8) $L_{pp} = 20 \log_{10} 1/N \sum 10^{\ (Lj/20)}$

9) $T_L = 10\log10 \left\{ \frac{s}{\tau 1 s1 + \ldots. + \tau 2 s2} \right\}$

10) $T_L = 10 \log_{10} 1/\tau$

11) NNI = Average Peak Noise Level + $15 \log_{10} N$ - 80

Average Peak Noise Level = $10 \log10\ 1/N \sum 10^{\ \text{Peak noise level }/10}$ dB (A)

12) Traffic Leq = 42.3 + 10.2 log (Vc + 6 Vt) – 13.9 log D + 0.13 S

13) Traffic Ldn = 31.0 + 10.2 log [AADT+ T% AADT/20)] -13.9 log D + 0.13 S

Pasquill Stability Class

Wind at 10 m (m/s)	Day			Night	
	Incoming solar radiation			Cloud cover	
	Strong	Moderate	Slight	Thinly overcast or ≥4/8 clouds	Mostly clear or ≤3/8 clouds
< 2	A	A - B	B	G	G
2 – 3	A - B	B	C	E	F
3 – 5	B	B - C	C	D	E
5 – 6	C	C - D	D	D	D
> 6	C	D	D	D	D

1-A: extremely unstable
2-B: moderate unstable
3-C: Slightly unstable
4-D: neutral
5-E: slightly stable
6-F: moderate stable
7-G: extremely stable, *used for radioactive sources only*

Variation of the wind speed exponent p with stability category

Pasquill Stability Class	exponent p for rough terrain	exponent p for smooth terrain
A – the most unstable	0.15	0.07
B	0.15	0.07
C	0.20	0.10
D	0.25	0.15
E	0.40	0.35
F – the most stable	0.60	0.55

Formulas Recommended by Briggs ($10^2 < x < 10^4$ M) – Urban Area		
Pasquill Type	**σ_y (m)**	**σ_z (m)**
A-B	$0.32\,x\,(1+0.0004x)^{-1/2}$	$0.24\,x\,(1+0.001x)^{-1/2}$
C	$0.22\,x\,(1+0.0004x)^{-1/2}$	$0.20\,x$
D	$0.16\,x\,(1+0.0004x)^{-1/2}$	$0.014\,x\,(1+0.0003x)^{-1/2}$
E-F	$0.11\,x\,(1+0.0004x)^{-1/2}$	$0.08\,x\,(1+0.00015x)^{-1}$

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