First Semester Examination
2017/2018 Academic Session

January 2018

EAP583 – Air and Noise Pollution

Duration : 2 hours

Please check that this examination paper consists of FIVE (5) pages of printed material including appendix before answering the question.

Instructions : This paper contains **FIVE (5)** questions. Answer **FOUR (4)** questions.

All questions must be answered in English.

Each question **MUST BE** answered on a new page.

1. (a) Discuss the Air Quality Management and all factors that could possibly impede its implementation.

[25 marks]

2. (a) Discuss **THREE (3)** factors affecting dispersion of air pollution in the atmosphere.

[9 marks]

(b) Atmospheric stability is best described by the buoyant force acting on a parcel of air. **Figure 1** shows stable atmospheric condition. Prove that the air parcel can move back to the original location in stable atmosphere, that relates to pressure (*P*), temperature (*T*) and mass (*m*).

Given that buoyant force is $F_{bouyant} = Vg(\rho_{atm} - \rho_{air\,parcel})$

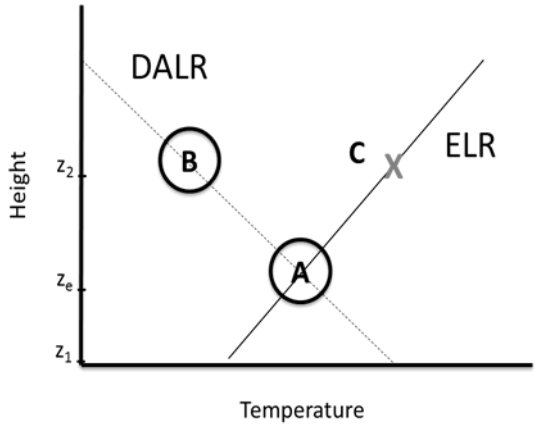

Figure 1

[16 marks]

3. (a) Explain the 'near real-time' measurement methods for criteria gaseous and particulate pollutants within the Continuous Air Quality Monitoring Network.

[12 marks]

(b) Illustrate and define a typical impulsive noise Type A.

[3 marks]

(c) Calculate the Traffic Noise Index (TNI) and $L_{eq(1hour)}$ for the monitoring data in **Table 2.**

Table 2

Time (minutes)	Sound Pressure dB(A)
10	84
20	85
30	87
40	83
50	82
60	78
70	76
80	81
90	77
100	80

[10 marks]

4. (a) Our ears are sensitive to certain threshold level of noise. Describe the threshold of hearing in terms of frequency, pressure and power.

[5 marks]

(b) A wavelength generated from a jet engine is 0.50 m at atmospheric pressure 101.325 kPa and temperature 5°C. Calculate the sound frequency in Hz. Take $C=20.05T^{1/2}$ and K=C+273.15.

[5 marks]

(c) There are many noise analyses methods done for specific purpose. With the help of a sketch diagram, define the Octave band and give **ONE (1)** of its applications.

[6 marks]

(d) Calculate the average Sound Pressure Level for the following data in dB: 80, 75, 60, 66, 78.

[4 marks]

(e) Given that a sound power from a power station is $1x10^{-3}$ watt, determine the Sound Intensity Level which will be heard by a person who stands 10 m away of the source.

[5 marks]

5 (a) State **THREE (3)** guidelines of an ambient noise levels in Malaysia.

[6 marks]

(b) Sketch the possible noise path through a barrier (wall).

[6 marks]

(c) Discuss **THREE (3)** methods of noise control and give **ONE (1)** example for each of the method.

[13 marks]

APPENDIX

Useful formulae:

$K = 275 + 10°C$

$C = 20.05T^{1/2}$

$I = w/s$

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

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

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

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

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

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

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

$$T_L = 10 \log_{10} \left\{ \frac{s}{\tau 1 s1 + \ldots + \tau 2 s2} \right\}$$

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

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

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

Traffic Leq = $42.3 + 10.2 \log (Vc + 6\ Vt) - 13.9 \log D + 0.13\ S$

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

$L_{NP} = Leq + (L_{10}-L_{90})$

$TNI = 4\ (L_{10}-L_{50}) + L_{90} - 30$

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