UNIVERSITI SAINS MALAYSIA

First Semester Examination
Academic Session 2009/2010

November 2009

EAP 583/4 – Air & Noise Pollution Control

Duration : 3 hours
[Masa : 3 jam]

Please check that this examination paper consists of **EIGHT (8)** printed pages including appendices before you begin the examination.

Instructions:

This paper contains **SIX (6)** questions. Answer **FIVE (5)** questions only.

You may answer the question either in Bahasa Malaysia or English

All questions **MUST BE** answered on a new page.

Write the answered question numbers on the cover sheet of the answer script.

1. a) Air pollutant emitted from motor vehicles exhaust contributes mainly to air pollution loading in Malaysia. It was estimated that 27 millions vehicles were registered with 70% running on Malaysian road network, whereby half of these are believed to be cars. Calculate exhaust emissions of cars from 15 km of a dual carriageway bridge. It was estimated that 20 g/km CO were emitted from a car on a clear day. Average car length is 3.5 m.

(10 marks)

   b) Notions that vehicles emissions can be reduced by management and engineering control has been in place for quite sometime. Draw framework to reduce air pollutions derived from vehicles exhaust especially in urban areas. Your discussion should include both control measures for short and long term strategy.

(10 marks)

2. a) Calculate the concentrations of sulphur dioxide at ground level open area at points located 1.0, and 2.0 downwind in bright and stable atmospheric condition emitted from a stack of a coal fired power station, with daily mass of solid fuel burned 5000 tonne.   The stack is 70 m height with internal radius of 15 m, exit velocity of 25 m/s at temperature 413 K. Wind velocity at 10 m is 12 m/s. Given sulphur content of solid fuel is 3.0%.

(10 marks)

   b) Haze events normally occur during dry season. It is aggravated by transboundary as well as local air pollutions. Local air quality management (LAQM) plays a major role in controlling haze conditions. Describe LAQM in relation to Malaysian conditions.

(10 marks)

3. a) Discuss the effects of increasing air pollutions on building materials by giving appropriate examples.

(10 marks)

b) Describe clearly methods for measuring particulate matter in ambient air.

(10 marks)

4. a) i) By giving a suitable example, prove that sound can be propagated in a circular shape.

(2 marks)

ii) Sketch the wave pattern and write the relationship between wavelength, speed and frequency.

(4 marks)

b) Calculate the wavelength of a sound from a small aircraft travels at a sound frequency of 3000 Hz and at the air temperature of 2ºC.

(5 marks)

c) Calculate the value of Equivalent Sound Level, Leq (90 minutes) for the following noise data. (Table 1)

Table 1

Time (minutes)	Sound Pressure dB (A)
10	84
20	76
30	74
40	75
50	74
60	75
70	77
80	78
90	60
100	65
110	80
120	72

(6 marks)

d) Name **THREE (3)** types of noise analyses.

(3 marks)

5. a) Sketch a typical impulsive noise Type A.

(3 marks)

b) Calculate the Traffic Noise Index (TNI) for the following monitoring data.
    (Table 2)

Table 2

Time (minutes)	Sound Pressure dB (A)
15	80
30	75
45	85
60	69
75	78
90	80
105	90
120	86

(9 marks)

c) Given that a Sound Power Level from a power station is 95 dB. Determine the sound intensity level which will be heard by a person who stands 20 m away of the source.

(8 marks)

6. a) With the help of a sketch, explain the measurement procedures of an exhaust noise from a motorcycle in Malaysia, as given in the Third Schedule of the Environmental Quality (Motor Vehicle Noise) Regulations 1987, under the Environmental Quality Act 1974.

(7 marks)

b) Predict the Leq from the following traffic data:

  Number of 4 wheel vehicle   =13,920 vehicle/day

  Number of 6 wheel vehicle   =3600 vehicle/day

  Distance to receiver   =20 m

  Average speed of vehicle in 1 hour   =75 km/hour

(6 marks)

c) Name **THREE (3)** noise control methods at the transmission path. Discuss briefly **ONE (1)** of the method.

(7 marks)