UNIVERSITI SAINS MALAYSIA

First Semester Examination
2012/2013 Academic Session

January 2013

EAP 585/4 – Solid and Hazardous Waste Management

Duration : 3 hours

Please check that this examination paper consists of **FOUR (4)** pages of printed material before you begin the examination.

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

All questions must be answered in English.

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

1. (a) The use of incineration to treat hazardous wastes has the potential to emit toxic gases such as dioxins. Dioxins are products of incomplete combustion which can be minimised through control of the incineration process. Elaborate **THREE (3)** factors that should be taken into consideration when designing an incinerator and their influence over the combustion process.

[8 marks]

(b) As an environmental engineer at Majlis Perbandaran Seberang Perai, your responsibilities include finding solutions to the current hazardous wastes for the Seberang Perai region. For each of the hazardous wastes listed below, propose **ONE (1)** suitable treatment technique by (i) discussing the mechanism behind the treatment process and (ii) identifying **TWO (2)** limitations/disadvantages of the proposed treatment.

i. Contaminated soil from arsenic spillage at a petrochemical plant
ii. Liquid radioactive wastes from a nuclear reactor plant
iii. Hazardous fly-ash from medical waste incineration

[12 marks]

2. (a) As an environmental engineer at the Department of Environment (DOE), your responsibility includes the management of Scheduled Wastes by the industries. You were alerted to an illegal dumping of clinical wastes at Hutan Rekreasi Bukit Panchor. The site is a forest reserve with stream and located in a village area. Elaborate your concerns regarding the above incident including strategies of prevention and/or improvement.

[10 marks]

(b) Under the Environmental Quality Act (EQA) 1974, waste is “any matter which is emitted, discharged or deposited in the environment in such volume, composition or manner as to cause pollution”. If waste meets the definition of solid waste, it will then be considered to be hazardous waste when it meets certain criteria. Support the above statements with facts and examples.

[10 marks]

3. (a) Describe briefly **FIVE (5)** factors that influence of solid waste generation rates.

[10 marks]

(b) There are several types of waste container collection system. With a sketch diagram, explain the difference between them.

[10 marks]

4. (a) Determination of break–even point is an important step in transfer station economic analysis. Describe briefly with a sketch diagram of that decision making process.

[10 marks]

(b) A total of 11 apartment complexes and commercial establishments have entered into a contract with a solid waste collection firm to collect their solid waste. A 20 m^3 vehicle is available for collection. The discarded volume of solid wastes to be collected is 96 m^3/week. If it is decided to have two collections per week, calculate the trips have to be made on a collection day. Also determine the size of the container to be provided. Assume that r = 2.5 and for simplicity, assume that each of the 11 sources contributes the same amount of solid wastes. Make any essential assumptions if necessary.

[10 marks]

5. (a) One of the solid waste treatment options is incineration. Describe briefly about the processes involved in an incineration plant.

[6 marks]

(b) Describe briefly about the process of aerobic composting and discuss the factors affecting composting processes**.**

[8 marks]

(c) Penang has a landfill site which is 20m high and encompasses 10 hectare (assume a rectangular solid) and has been in operation since for 15 years. Records show they do about 0.85kg/capita/day. Assume 15% cover material. Calculate the total volume of waste disposed and estimate the population assuming a flat population curve.

[6 marks]

6. Discuss legal requirements for scheduled wastes handling from their generation to disposals at prescribed facilities.

[20 marks]

oooOOOooo