
UNIVERSITI SAINS MALAYSIA

First Semester Examination
Academic Session 2008/2009

November 2008

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 only. All questions carry the same marks.

You may answer the question either in Bahasa Malaysia or English.

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

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

1. (a) Described incompatible scheduled waste and on-site treatment facility using examples.

[10 marks]

- (b) In the First Schedule of the Environmental Quality Scheduled Waste Regulations 2005, waste is classified into several categories. List all categories and give **TWO (2)** examples for each category.

[10 marks]

2. Waste generation study was done at 3 USM hostel. After a week of study, the result was shown in Table 1. The collection scheduled was on Tuesday and Saturday morning. If every block is provided 2.5m^3 of container, container utilization factor is 0.7 and the density of waste is $150\text{kg}/\text{m}^3$.

| Hostel Name | No. Of Block | Waste Collected (Tonne) | Average Kg/cap/day | Average Kg /block/day | Number of Student | Number of container |
|-------------|--------------|-------------------------|--------------------|-----------------------|-------------------|---------------------|
| Active | 4 | 5.0 | 0.60 | | | |
| Creative | 3 | 4.5 | 0.55 | | | |
| Innovative | 5 | 6.5 | 0.75 | | | |

- (a) The average amount of waste generated per block per day

[5 marks]

- (b) The total number of student for every hostel

[5 marks]

- (c) Calculate number of container for each hostel.

[5 marks]

- (d) If Container pickup time is 0.04h/trip, container unloading time = 0.04h/trip, hauled time constants: $a = 0.02$ and $b = 0.02\text{h/km}$, at landfill site time = 0.05h/trip, calculate the total time to collect all container at the hostel?

[5 marks]

3. An economic analysis was done to have a transfer station shown as below:

- Transfer Station Cost: cost to build, own, and operate transfer station, = RM4.50/tonne.
- Direct Haul Payload: average payload of collection vehicle hauling directly to landfill = 3.50/hr-tonne.
- Transfer Haul Payload: average payload of transfer truck hauling from transfer station to landfill, RM1.20/hr-tonne.

- (a) Define what is break even point?

[5 marks]

- (b) Based on the above data, plot the break even curve and determine the critical time to have a transfer station.

[15 marks]

4. What is the advantage and disadvantage of this solid treatment technique?

- (i) Incineration
- (ii) Composting
- (iii) Landfilling

[12 marks]

- (a) A city with a population of 30000 people generated solid waste at a rate of 1.5kg/capita/day . If the waste could be compacted to 6000kg/m^3 .

- (i) how many acres of landfill will be needed in a year? Assuming that the ratio of solid waste to soil cover is 4:1,
- (ii) what volume of soil cover will be needed in a year?

[8 marks]