First Semester Examination
2017/2018 Academic Session

January 2018

EAP585 – Solid And Hazardous Waste Management

Duration : 2 hours

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

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

[10 marks]

(b) Determination of break–even point is an important procedure in transfer station economic analysis. With a sketch diagram describe briefly the economic analysis in the decision making process.

[15 marks]

2. (a) Describe briefly **TWO (2)** of the following treatment technologies and discuss the factors affecting their processes**.**

(i) Incineration
(ii) Composting
(iii) Anaerobic digestion
(iv) Material recovery facilities.

[10 marks]

(b) **Figure 1** is the waste separation flow at MRF plant. The separation process includes shredder, air clasifier, magnetic separator and screen with final disposal to landfill. Using the data given in **Figure 1**, complete the necessary information in **Table 1** of waste recovered, pass through, residue to landfill and its composition.

Table 1 : Performance of Waste Segregation Plant

Component	Collected	Recovered			Pass Through			To Landfill	% Composition
	% by wt.	Air Classifier	Magnet	Screen	Air Classifier	Magnet	Screen		
Food Waste	25								
Paper	12								
Glass	10								
Steel	7								
Plastics	16								
Wood	8								
Yard Waste	15								
Leather	2								
Rubber	5								
Total									

...3/-

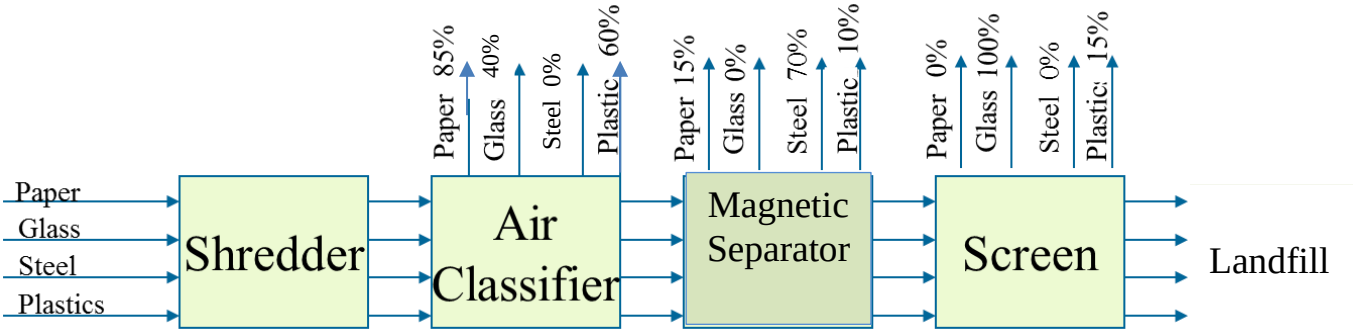

Figure 1: Waste separation plant flow

[15 marks]

3. (a) Describe the contrast between items in each of the following pairs. Use only **TWO (2)** sentences the maximum in each description:

(i) Inert waste vs. municipal waste
(ii) Cell bund vs. leachate dam
(iii) Daily cover vs. final cover
(iv) Borehole vs. monitoring well
(v) Wash trough vs. weigh bridge
(vi) Bio-treatment vs. physico-chemical treatment
(vii) Berm vs. batter face
(viii) Anaerobic decomposition vs. aerobic decomposition
(ix) Geotextile vs. geomembrane
(x) Leachate treatment plant (LTP) vs. leachate holding pond (LHP)

[10 marks]

(b) A community produces 500 tons of waste per day. A new 1000 m x 1000 m landfill site on perfectly flat ground has just been acquired. Estimate the expected service lifetime, in years, for the landfill. Assume the following:

(i) Depth to groundwater is 6 m, therefore excavation is allowed up to 5 m deep.
(ii) The final height allowed for the landfill with 45 degree slopes is 25 m.
(iii) The height of each bench is 5 m, while the width of each berm is 2 m.
(iv) Density of deposited waste is 400 kg/cubic meter on the average.

[15 marks]

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4. In 2008, a E-Waste management pilot study was conducted in Penang, to understand its current management and plan for further improvement.

   (a) Describe E-waste and reasons for it being considered as hazardous

   [5 marks]

   (b) Sketch and describe the current E-waste management flow diagram of the 2008 study

   [8 marks]

   (c) Appraise the challenges in implementing E-waste management and suggest strategies to increase recovery of E-waste

   [12 marks]

5. (a) List out **FIVE (5)** alternatives to landfilling which are to be encouraged by regulatory and other efforts.

   [5 marks]

   (b) Explain **TWO (2)** types of mechanism of physical and chemical treatment for scheduled waste.

   [8 marks]

   (c) Describe an integrated waste management system that is applicable towards scheduled waste management.

   [4 marks]

   (d) Draw a schematic diagram of a secured landfill with an explanation of the system.

   [8 marks]

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