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Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

**FINAL EXAMINATION
SEMESTER II
SESI 2018/2019**

COURSE NAME : SOLID AND HAZARDOUS WASTE
MANAGEMENT

COURSE CODE : BFA40303

PROGRAMME CODE : BFF

EXAMINATION DATE : JUNE / JULY 2019

DURATION : 3 HOURS

INSTRUCTION : 1. ANSWER FIVE (5)
QUESTIONS ONLY
2. IF Q1 IS ANSWERED,
ATTACH APPENDIX 1 IN THE
ANSWER BOOKLET

THIS QUESTION PAPER CONSISTS OF FIVE (5) PAGES

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- Q1** (a) Complete the flow chart as shown in **Figure Q1 (a)** and describe each of the terms as filled in the flow chart. (3 marks)
- (b) Briefly explain your understanding on Integrated Solid Waste Management (ISWM) system. (4 marks)
- (c) Based on waste management concept, discuss thoroughly on how to implement waste minimization in Malaysia. (6 marks)
- (d) Evaluate thoroughly on how the physical, chemical and biological properties identification benefits the waste management system. (7 marks)
- Q2** (a) Identify **THREE (3)** main purposes of waste separation. (3 marks)
- (b) Briefly explain **TWO (2)** main factors affecting waste generation rates. (4 marks)
- (c) With the aid of a diagram, explain the following collection systems in solid waste management. (6 marks)
- (i) Hauled container system (HCS)-conventional
 - (ii) Hauled container system (HCS)-exchange container mode
 - (iii) Stationary container system (SCS)

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- (d) By using the information given below and layout in **Figure Q2(d)**. Assume:
Occupants per resident = 5
Solid waste generation rate = 1.5 kg/person.d
Number of trips per week = 6
Collection crew number = two person
Compacted volume of solid waste in collection vehicle = 108 kg/m³

Determine:

- (i) Total number of residences which waste are to be collected. (1 mark)
- (ii) Compacted density of solid waste collected per week. (1 mark)
- (iii) Collection vehicle capacity. (1 mark)
- (iv) Average number of residence which waste are to be collected each day. (1 mark)
- (v) By assuming that the right side of the residential area is a hilly area and there is U-turn in each street (**Figure Q2(d)**), design collection routes for the residential area in **Figure Q2 (d)**. (3 marks)

- Q3** (a) Explain briefly the **THREE (3)** types of landfilling method and choose the best method with justifications. (3marks)
- (b) With the aid of a diagram, differentiate between conventional landfill and sanitary landfill. (4 marks)
- (c) Illustrate and explain **FIVE (5)** phases of gas generation in landfill. (6 marks)
- (d) Analyse and propose the best disposal method between landfill, incinerator and composting. Evaluate on the chances of success or failure in disposing the solid waste using the method that you proposed in Malaysia. (7 marks)

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- Q4**
- (a) Describe hazardous waste by referring to US. Environmental Protection Agency (EPA). (3 marks)
 - (b) Explain briefly ignitability and corrosivity. (4 marks)
 - (c) Differentiate personal protection equipment (PPE) of Level A and D and state the most stringent level. (6 marks)
 - (d) Justify **THREE (3)** importances of the Emergency Response Plan (ERP) by giving sufficient arguments. (7 marks)
- Q5**
- (a) Define the term biological treatment. (3 marks)
 - (b) Explain briefly **TWO (2)** factors affecting bioremediation. (4 marks)
 - (c) Illustrate the in-situ solidification and stabilization with the aid of sketches. (6 marks)
 - (d) Recommend **THREE (3)** advantages of bioremediation. (7 marks)
- Q6**
- (a) Define the term groundwater contamination (3 marks)
 - (b) Explain briefly the immediate and planned removal. (4 marks)
 - (c) Illustrate the air sparging with the aid of sketches (6 marks)
 - (d) Recommend **THREE (3)** functions of drain tile collection in the subsurface. (7 marks)

END OF QUESTIONS

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