



**UNIVERSITI TUN HUSSEIN ONN MALAYSIA**

**FINAL EXAMINATION  
SEMESTER II  
SESSION 2016/2017**

COURSE NAME : SOLID AND HAZARDOUS WASTE  
MANAGEMENT

COURSE CODE : BFA 40303

PROGRAMME CODE : BFF

EXAMINATION DATE : JUNE 2017

DURATION : 3 HOURS

INSTRUCTIONS : ANSWER **FOUR (4)** QUESTIONS  
ONLY

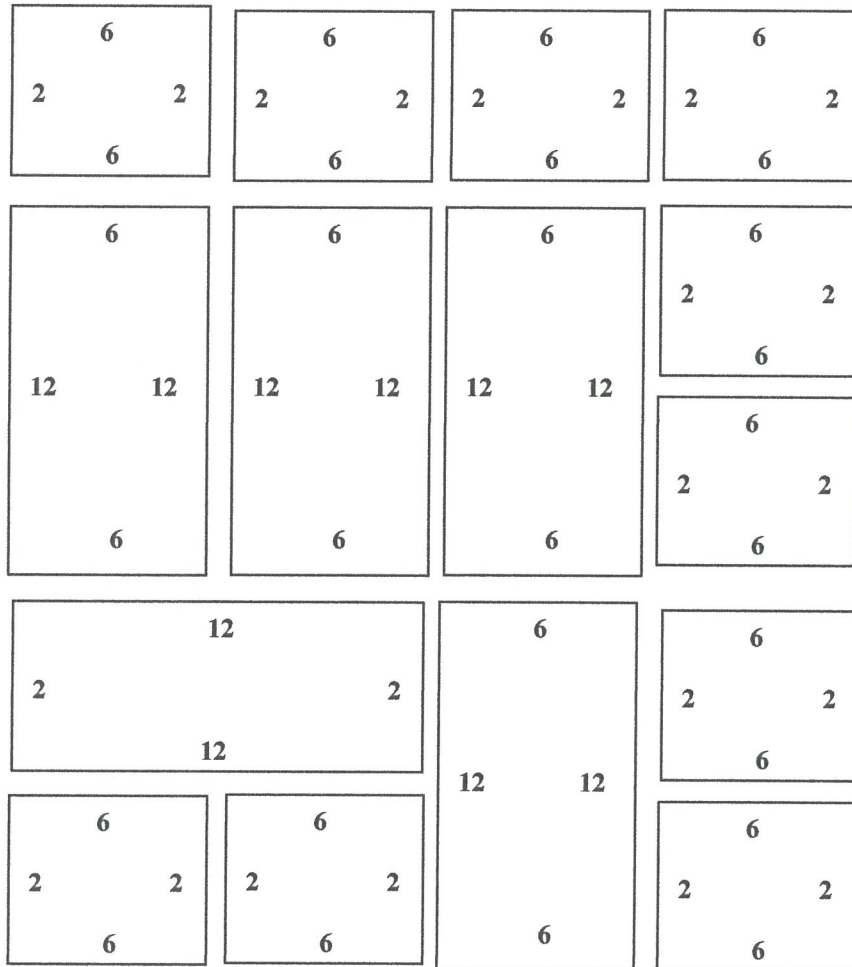
THIS PAPER CONSISTS OF **FOUR (4)** PAGES

- Q1** (a) Define Integrated Solid Waste Management (ISWM) and explain the advantages of municipal solid waste separation in ISWM. (7 marks)
- (b) Propose **FOUR (4)** actions that could be taken to enhance waste minimization. (8 marks)
- (c) Show **SIX (6)** steps in the hierarchy of Integrated Solid Waste Management (ISWM) from the least to the most favoured option and discuss with respect to source minimization, reuse, and waste transformation. (10 marks)
- Q2** (a) Compare setout–setback with setout service and explain method for manual collection of residential wastes. (7 marks)
- (b) With the aid of a diagram, illustrate and describe **TWO (2)** most common collection system in solid waste management and choose the best system with sufficient reason. (8 marks)
- (c) **Figure Q2(c)** is a layout of a residential city that generates 0.8 kg/person.day of municipal solid waste. On average, each house is occupied by 5 people. Calculate the followings:
- Number of houses which waste are to be collected from the residential city.
  - If the compacted density of solid waste in collection vehicle is 100 kg/m<sup>3</sup>, determine the compacted volume of solid waste to be collected per week.
  - If the collection vehicle capacity is 50 m<sup>3</sup>, determine the number of trips per week.
  - The average numbers of houses from which wastes are to be collected for each trip.
  - Sketch the collection routes for the residential city in **Figure Q2(c)** by assuming that there is no U-turn in each street.
- (10 marks)

- Q3** (a) Suggest **TWO (2)** appropriate ways to recycle/ dispose the hazardous waste with greater care. (7 marks)
- (b) Determine how the following waste become hazardous waste;  
i) Electronic waste.  
ii) Nuclear waste.  
iii) Construction waste.  
iv) Pharmaceutical waste (8 marks)
- (c) Discuss **FOUR (4)** characteristics of hazardous waste. Give **ONE (1)** reason why hazardous waste could not be treated using conventional waste treatment. (10 marks)
- Q4** (a) Suggest and explain the appropriate treatment for combined hazardous waste existed in the form of solid and liquid. (7 marks)
- (b) (i) Explain briefly the chemical treatment for hazardous waste and state **ONE (1)** example of the treatment.  
(ii) Differentiate the carbon adsorption and ion exchange with respect to their mechanism to remove hazardous waste. (8 marks)
- (c) Discuss the step for deep well injection and provide the reasonable reason for not adapting the deep well injection. (10 marks)
- Q5** (a) Plastic bag is the most common non-putrescible wastes in your community. Give **ONE (1)** reason for the extra uses on plastic and **TWO (2)** main environmental impact from plastic. (7 marks)
- (b) (i) Discuss thoroughly the importance to identify the physical, chemical and biological properties of solid waste.  
(ii) Differentiate immediate removal and planned removal. (8 marks)
- (c) Discuss the preliminary assessment of EPA groundwater remediation procedure. Provide **THREE (3)** site classifications by EPA regarding on the basis of the preliminary assessment. (10 marks)

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2, 6, 12 = number of houses

↓  
To landfill

Figure Q2(c)

-END OF QUESTIONS -