Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER II
SESSION 2015/2016

COURSE NAME	:	SOLID AND HAZARDOUS WASTE MANAGEMENT
COURSE CODE	:	BFA 40303/BFA 4033
PROGRAMME CODE	:	BFF
EXAMINATION DATE	:	JUNE/ JULY 2016
DURATION	:	3 HOURS
INSTRUCTIONS	:	ANSWER **FOUR** QUESTIONS ONLY FROM SIX QUESTIONS

THIS QUESTION PAPER CONSISTS OF **NINE (9)** PAGES

Q1 (a) Define municipal solid waste (MSW) and Integrated Solid Waste Management (ISWM).

(4 marks)

(b) Integrated Solid Waste Management System (ISWM) is a very important system in Malaysia.

(i) Briefly explain the advantages of municipal solid waste separation in ISWM.

(6 marks)

(ii) Propose the action that could be taken to enhance waste minimization.

(5 marks)

(c) Discuss **SIX (6)** steps in the hierarchy of Integrated Solid Waste Management (ISWM) from the least to the most favoured option, with respect to source reduction, reuse, recycling (3R) and waste transformation.

(10 marks)

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Q2 (a) Define **TWO (2)** types of residential collection services used in waste Management.

(4 marks)

(b) With the aid of a diagram, discuss the advantages and disadvantages of **TWO (2)** most common collection systems 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.

(i) Determine number of houses which waste are to be collected from the residential city.

(1 mark)

(ii) If the compacted density of solid waste in collection vehicle is 100 kg/m^3, determine the compacted volume of solid waste to be collected per week.

(2 marks)

(iii) If the collection vehicle capacity is 50 m^3, determine the number of trips per week.

(2 marks)

(iv) Determine the average numbers of houses from which wastes are to be collected for each trip.

(1 mark)

(v) By assuming that the left side of the residential area is a hilly area and there is no U-turn in each street **Figure Q2 (c)** design collection routes for the residential city in **Figure Q2 (c).**

(2 marks)

(d) Discuss thoroughly on how to recycle hazardous waste from home by giving appropriate examples.

(7 marks)

Q3 (a) State **THREE (3)** importance of the landfill site selection.

(3 marks)

(b) Briefly explain on the following factors affecting the consideration of landfill siting:

(i) Surface water hydrology.
(ii) Geologic and hydro geologic conditions.
(iii) Ultimate use of completed landfill.

(7 marks)

(c) Identify and briefly explain type of landfilling method for area with high groundwater level and terrain is not suitable for excavation.

(3 marks)

(d) Discuss the purposes of landfill final cover and its criteria.

(3 marks)

(e) Scavengers working in a landfill sites are exposed to various health risks (infections, injury, disability) while working. Propose a proper plan in helping local authority to minimize risks of scavenger safety and health issues in Malaysia.

(9 marks)

Q4 (a) List the regulation and policies that are currently in place in Malaysia to monitor the transportation of hazardous wastes.

(3 marks)

(b) Identify **TWO (2)** potential sources of hazardous waste generated in the university environment and examine what properties make such substances hazardous.

(7 marks)

(c) Identify and label accordingly the waste in the **Table Q4 (c)** based on its EU description and label.

(7 marks)

(d) Discuss **FOUR (4)** ways in which the hazardous waste management able to protect the water sources from possible contamination of hazardous waste.

(8 marks)

Q5 (a) Find the best chemical method to treat highly basic and acidic solution.

(3 marks)

(b) List the **FOUR (4)** physico-chemical treatments of hazardous waste.

(4 marks)

(c) In the construction of secure landfill, several types of liner are required to be constructed. Explain the type and purpose of each of the liners.

(7 marks)

(d) Propose a suitable disposal method for liquid waste (Class II) from conventional oil or natural gas production and elaborate on the proposed method.

(11 marks)

Q6 (a) Define groundwater contamination term and list **TWO (2)** of the potential contaminants from secured landfill to pollute groundwater.

(4 marks)

(b) With the aid of sketches, illustrate the potential pathways for contaminant migration at an uncontrolled hazardous waste site.

(4 marks)

(c) Propose **THREE (3)** active groundwater remediation systems for onsite cleanup.

(12 marks)

(d) Recommend the most common technique to confine, prevent and minimize contaminant transport in the groundwater system.

(5 marks)

-END OF QUESTIONS-

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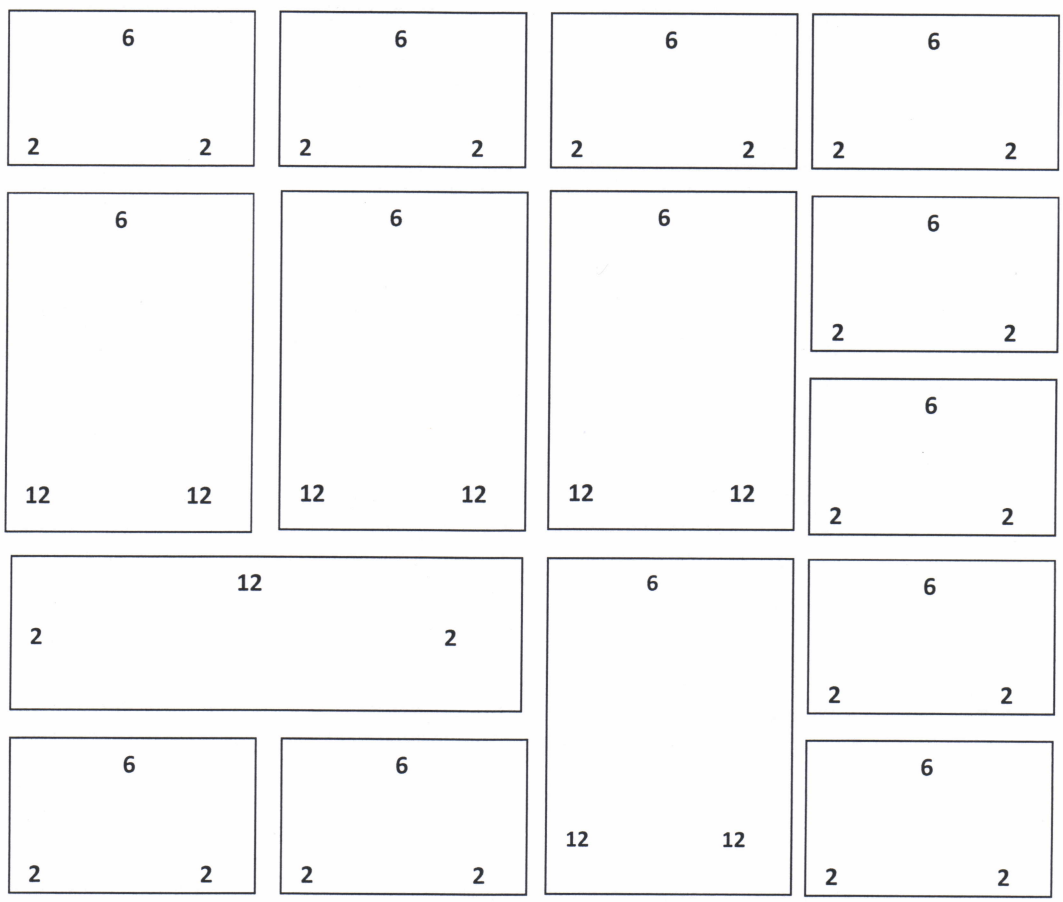

FIGURE Q2

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Name:

Matriculation No.:

Section:

Name of lecturer:

TABLE Q4 (c)

Waste type	Description	Label
Bleaching agent	Corrosive	
Gasoline		
Aerosol	Flammable	
Paints		H6
Ink toner		

Note : Submit this page together with your answer script