Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER II
SESSION 2013/2014

COURSE NAME	:	SOLID AND HAZARDOUS WASTE MANAGEMENT
COURSE CODE	:	BFA 40303/BFA 4033
PROGRAMME	:	BFA
EXAMINATION DATE	:	JUNE 2014
DURATION	:	3 HOURS
INSTRUCTIONS	:	ANSWER **FOUR** QUESTIONS ONLY FROM **SIX** QUESTIONS

THIS QUESTION PAPER CONSISTS OF **SIX (6)** PAGES

Q1 (a) Define Municipal Solid Waste (MSW) and Integrated Solid Waste Management (ISWM).

(4 marks)

(b) Discuss on how the physical, chemical and biological properties identification benefits the waste management system.

(6 marks)

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

(i) Illustrate the steps taken in implementing Integrated Solid Waste Management System (ISWM) in daily waste management.

(6 marks)

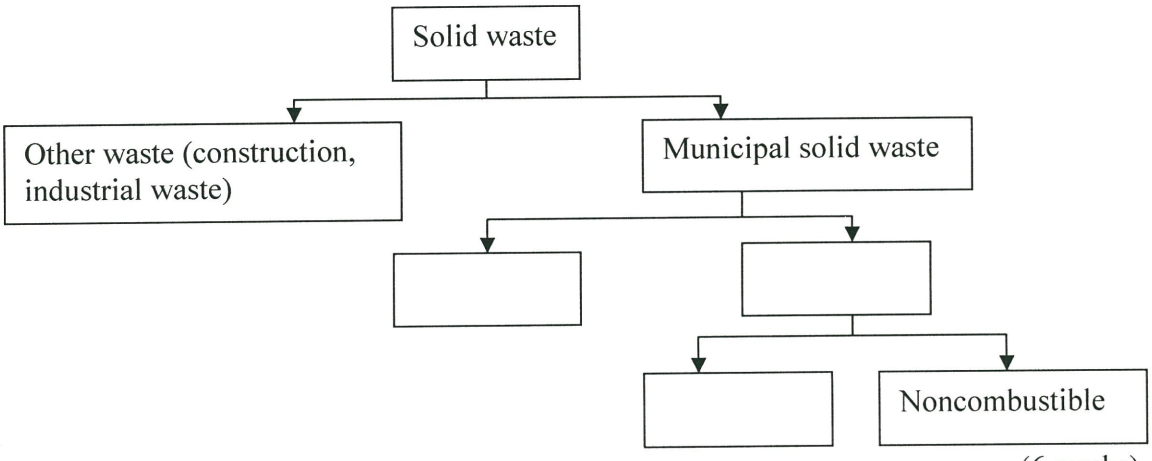
(ii) Propose the action that could be taken to enhance waste minimization.

(5 marks)

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

(4 marks)

Q2 (a) Complete the chart and define the terms for the missing item.



(6 marks)

(b) A town of 2,000 houses generates 133,000 kg/week of municipal solid waste. By assuming that 1 house occupied with 10 residents, how much municipal solid waste will be generated by;

(i) person in a day.

(2 marks)

(ii) year.

(2 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 reduction, reuse, recycling (3R) and waste transformation.

(15 marks)

Q3 (a) Define **FIVE (5)** types of residential collection services used in waste management.

(5 marks)

(b) With the aid of a diagram, **THREE (3)** most common collection system in solid waste management

(i) Hauled container system (HCS)-conventional.

(3 marks)

(ii) Hauled container system (HCS)-exchange container mode.

(3 marks)

(iii) Stationary container system (SCS).

(3 marks)

(iv) Choose the best system with sufficient reason.

(1 mark)

(c) Figure **Q3 (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. Determine

(i) How many 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.

(2 marks)

(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 **Q3 (c)** design collection routes for the residential city in Figure **Q3 (c).**

(3 marks)

Q4 (a) Define **FOUR (4)** classification of landfill level in Malaysia.

(4 marks)

(b) Explain briefly **TWO (2)** of landfill leachate collection method.

(6 marks)

(c) A town of 100,000 populations generates 0.9 kg/person.day of municipal solid waste. A landfill is used to serve the town. The landfill size used is 40,000 m^2 with 20m depth, the compacted waste volume is 300 m^3/day, and the ratio of soil cover/compacted waste is 1.9. If 67% of the landfill has been used, calculate the life remaining of the landfill (in years). Determine;

(i) Density of solid waste generation.

(2 marks)

(ii) Volume of landfill.

(1 marks)

(iii)Total solid waste with soil cover material.

(2 marks)

(iv)Life span of landfill.

(1 mark)

(v) Life span of landfill after 67% usage.

(1 mark)

(d) Landfill is a better disposal method compared to incineration and composting. Debate thoroughly whether you are agree or disagree with the statement by providing the advantages and disadvantages of the disposal method.

(8 marks)

Q5 (a) Define hazardous waste and identify **FOUR (4)** characteristics of hazardous waste.

(6 marks)

(b) List **FOUR (4)** hazardous waste treatment technologies according to its priority with example and analyse the effectiveness of these treatment technologies in handling organic hazardous waste management.

(8 marks)

(c) A consultant who has sufficient experience in designing solid waste landfill has decided to use the same design to landfill that contains hazardous waste. Evaluate on the chances of success or failure of the particular design.

(11 marks)

Q6 (a) List **FOUR (4)** laws and regulations that is important in hazardous waste management.

(4 marks)

(b) A groundwater is contaminated with hazardous waste and required a remedial design. With the aid of a flow chart, propose step by step the groundwater remediation procedure that should be taken according to the guidelines by Environmental Protection Agency (EPA).

(10 marks)

(c) Remedial technologies focus to minimize or eliminate the hazard to human health and the environment. Critically compare between passive and active remediation systems and explain briefly **TWO (2)** examples for each remediation system.

(11 marks)

-END OF QUESTION-

FINAL EXAMINATION

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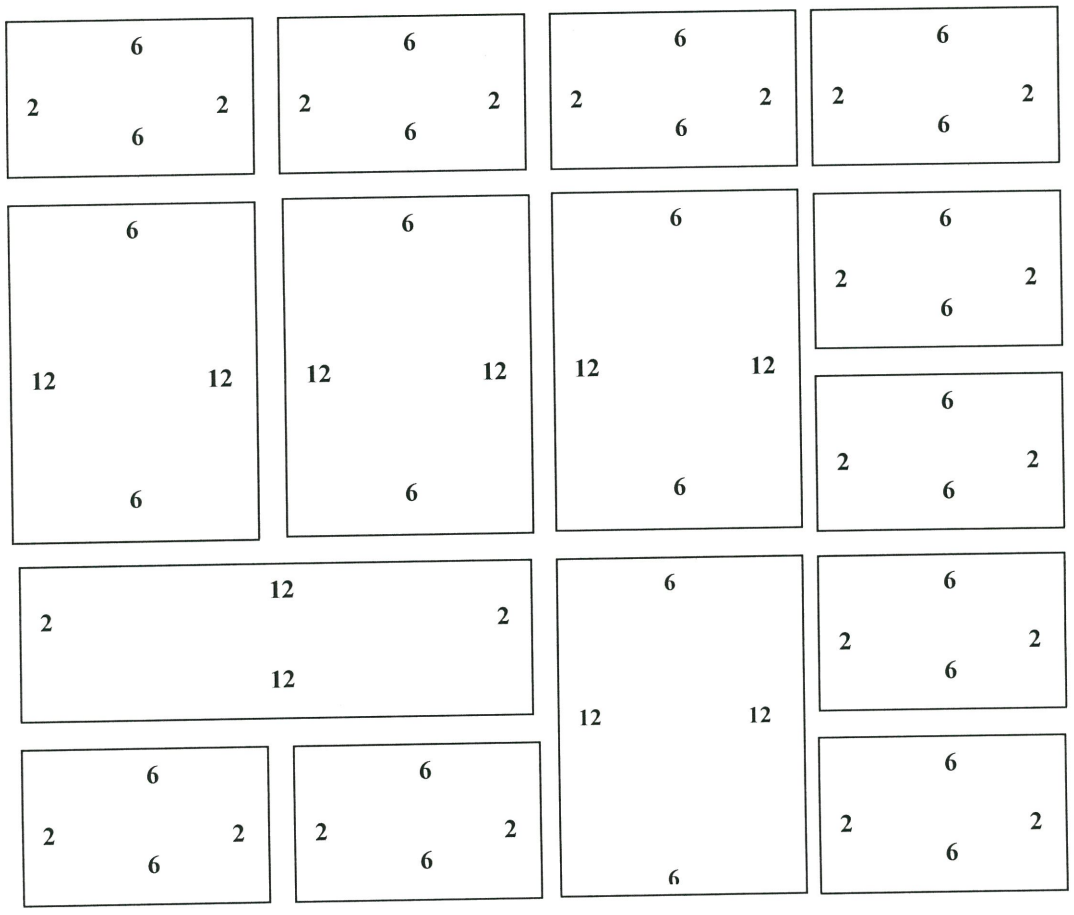

2, 6, 12 = number of houses

FIGURE Q3 (c)