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**UTHM**

Universiti Tun Hussein Onn Malaysia

**UNIVERSITI TUN HUSSEIN ONN MALAYSIA**

**FINAL EXAMINATION  
SEMESTER I  
SESSION 2021/2022**

COURSE NAME : GEOENVIRONMENTAL  
ENGINEERING

COURSE CODE : MFG 10203

PROGRAMME CODE : MFA

EXAMINATION DATE : JANUARY/FEBRUARY 2022

DURATION : 3 HOURS

INSTRUCTION :  
1. ANSWER ALL QUESTIONS  
2. THIS FINAL EXAMINATION IS  
AN **ONLINE** ASSESSMENT AND  
CONDUCTED VIA **CLOSE  
BOOK**

THIS QUESTION PAPER CONSISTS OF **THREE (3)** PAGES

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**Q1** On January 16, 1991 the UN coalition forces launched an assault against Iraqi military occupying Kuwait. This attack occurred more than six months after Iraq and Saddam Hussein occupied and repeatedly refused to leave Kuwait. On January 26, the press began to report that large amounts of crude oil were being released into the Persian Gulf.

It was revealed that in a last-ditch attempt to prevent U.S. forces from landing on the beaches of Kuwait, Iraqi forces intentionally dumped oil into the Persian Gulf. They released oil from eight oil tankers, a refinery, two terminals, and a tank field. Since the Iraqis anticipated an amphibious invasion, they also dug long trenches down the coastline and filled them with oil. The entire act of environmental terrorism released a total of 11 million barrels of crude oil into the Gulf, resulting in the largest oil spill in history. For the next three months, oil continued to spill into the Gulf at a rate of up to 6,000 barrels a day.

- (a) Based on the news report, assessing type(s) of pollution and contamination that had been taken place in Persian Gulf.  
(5 marks)
- (b) Deducing the effect of pollutant(s) identified in Q1(a) towards the physico-chemical properties of soil.  
(10 marks)
- (c) Analyze and predict the fate and transport of underground contamination in this case.  
(10 marks)
- (d) Based on your reading and geoenvironmental understanding, propose and evaluate any **ONE (1)** in-situ treatment technology that can be utilized in Persian Gulf.  
(10 marks)

**Q2** Rapid development of the economic had resulted in pollution issues becoming more serious. More and more heavy metals are migrated into the soils. The polluted soil can both destroy the structure of the natural soil and suppress the microbial activities. Thus, the pollutant is identified to have greatly altered the physico-chemical properties of soil.

- (a) Identify and explain any **TWO (2)** human activities that may contribute to heavy metal contamination of soil.  
(10 marks)
- (b) Several precedent researches indicated that pH of pore water is an important factor on heavy metal retention and migration. Explain the potential of mitigating heavy metal contamination by controlling its pH of pore water and how it works.  
(10 marks)

- (c) Propose and evaluate any **ONE (1)** in-situ treatment technology that is effective in site remediation.

(10 marks)

- (d) Compare and explain any **ONE (1)** disadvantages of using the in-situ treatment technology explained in Q2(c) when compared to ex-situ treatment technology.

(5 marks)

**Q3** The Malaysian Ministry of Housing and Local Government had on 27 July 2020 issued an announcement for the request for proposal (“**RFP**”) for a waste-to-energy project in Bukit Payong, Johor on a public-private partnership basis (“**WtE Project**”). The WtE Project is one of the 6 expected waste to energy projects that the federal government of Malaysia is planning to develop by 2021. The decision was made following the closure of CEP 1 Estate Sanitary Landfill in Simpang Renggam in March 2019 after reports of leachate overflow into a nearby river. Prior to this, the Federal government had postponed the construction of the Bukit Payong sanitary landfill due to protest by residents in the area.

- (a) Based on your reading and geoenvironmental understanding, propose and evaluate any **ONE (1)** geotechnology of waste management that can be utilized in this newly proposed WtE project

(10 marks)

- (b) It was reported in the newspaper that leachate was found to overflow from the CEP 1 Estate Sanitary Landfill in Simpang Renggam into a nearby river. Analyze and propose a new leachate collection system for newly proposed Bukit Payong site in order to minimize the potential risk of this incident to happen and convince the local community. Your proposal should also explain the lesson learnt from the failure in Simpang Renggam.

(15 marks)

- (c) Briefly explain the roles of engineers in this case from the perspective of geoenvironmental issues management.

(5 marks)

**-END OF QUESTIONS-**