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UNIVERSITI TUN HUSSEIN ONN MALAYSIA

**FINAL EXAMINATION
SEMESTER I
SESSION 2019/2020**

COURSE NAME : GEOENVIRONMENT
COURSE CODE : BNA 31703
PROGRAMME CODE : BNA
EXAMINATION DATE : DECEMBER 2019/JANUARY 2020
DURATION : 3 HOURS
INSTRUCTIONS : ANSWER ALL QUESTIONS

TERBUKA

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

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Q1 (a) Define the advection, diffusion and dispersion process in the transportation of contaminants.

(5 marks)

b) Discuss in detail how accidental release of hazardous chemicals into the subsurface would affect the environment. How may an engineer prevent the releases of these chemicals by using containment facilities?

(8 marks)

c) Discuss the benefits of ensuring sustainable development to the environment and refer with one case study as an example.

(12 marks)

Q2 (a) Explain with an example the potential source of contamination into the soil and groundwater system.

(4 marks)

(b) Explain the fate and transport of underground contamination between DNAPL and LNAPL with the aid of diagrams.

(12 marks)

(c) Describe the monitoring programme for the operation of a landfill to meet the required DOE regulations.

(9 marks)

Q3 (a) Discuss the electrical imaging resistivity method in groundwater contamination investigations.

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- (b) Revise why the methods listed below is more suitable for the monitoring of groundwater quality.
- i) Construction of monitoring well using percussion method rather than drilling method.
 - ii) Installation High Density Polyethylene (HDPE) pipe rather than Polyvinyl Chloride (PVC) pipe.
 - iii) Sampling of groundwater sample using purge pump rather than submersible pump.
- (8 marks)
- (c) Based on literature review a number of researchers made a statement that the main polluting substances of geo-environment are oil products. Predict the effects of this contaminants on the engineering properties of soils particularly the unconfined compression strength, compressibility and hydraulic conductivity.
- (9 marks)

- Q4** (a) Demonstrate the difficult aspect of in-situ electrokinetic method and phytoremediation technique in the remedial of soil contamination problem.
- (8 marks)
- (b) An underground storage tank removal project resulted in a 280 m³ of gasoline contaminated soil pile that has to be treated before disposal. Bioremediation has been selected as the treatment method. The porosity of soil is 34% and initial degree of saturation is 20%. Determine the amount of water needed for the first spray.
- TERBUKA** (7 marks)
- (c) Revise the **FIVE (5)** advantages and **FIVE (5)** disadvantages of soil vapor extraction and soil washing approaches in soil remediation.
- (10 marks)

-END OF QUESTIONS-