



UNIVERSITI TUN HUSSEIN ONN MALAYSIA

**FINAL EXAMINATION
SEMESTER II
SESSION 2014/15**

COURSE NAME : GEO-ENVIRONMENT
COURSE CODE : BFG 40303
PROGRAMME : BACHELOR OF CIVIL ENGINEERING
WITH HONOURS
DATE : JUNE 2015/JULY 2015
DURATION : 3 HOURS
ORDER : ANSWER ALL QUESTIONS

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

- Q1** (a) In Malaysia, before EQA 1974 (or in the US, before 1970s) it was not illegal to dispose of hazardous chemicals in unlined pits, and many companies did so. Should they be held responsible today for the contamination of those wastes, or should the government (taxpayers) pay for the cleanup? Give your comment based on that statement. (5 marks)
- (b) Discuss in detail how accidental release of hazardous chemicals into the subsurface would affect the environment. As an engineer, suggest how to prevent the releases of these chemicals by using containment facilities. (8 marks)
- (c) Discuss the benefits of ensuring sustainable development to the environment by referring to one case study as an example. (12 marks)
- Q2** (a) Explain with examples the potential source of contamination into the soil and groundwater system. (4 marks)
- (b) Describe the Acid Mine Drainage (AMD) and their environment effects due to mining activity. (12 marks)
- (c) Discuss in details the remedial monitoring in Environmental Remediation Process. (9 marks)
- Q3** (a) Discuss in detail, the electrokinetic remediation method to treat contaminated soil. (9 marks)
- (b) Perforated leachate collection pipes are placed with 80 m spacing over a geomembrane barrier. The underlying soil is graded 0.5 % parallel to the pipes only (i.e. an inclined plane).
- i) If there is a drainage blanket of fine gravel with $K = 0.1$ cm/s and an average annual infiltration of $q_0 = 0.2$ m/yr, calculate the average and the maximum head of leachate overlying the geomembrane (Use Harr's Equation).

$$h_{MAX} = 0.5L \left(\frac{q_0}{K} \right)^{0.5}$$

(8 marks)

- ii) If the drainage blanket clogs to $K = 5 \times 10^{-3}$ cm/s, calculate the maximum head of leachate. (8 marks)

- Q4** (a) Explain briefly with examples **THREE (3)** types of waste landfilled. (9 marks)
- (b) The filling sequence for a municipal solid waste landfill is listed in the following table:

Table Q4: Solid Waste Filling Record

Time Period	Height of Solid Waste Filled
1 st month	2.7
2 nd month	5.0
3 rd month	4.7
4 th month	4.0

Assume the following:

- Unit weight of solid waste, $\gamma_{\text{waste}} = 12 \text{ kN/m}^3$
- Original applied pressure for solid waste, $\sigma_o = 50 \text{ kN/m}^2$
- Modified primary compression index, $C'_c = 0.26$
- Modified secondary compression index, $C'_\alpha = 0.07$
- Secondary settlement starting time, $t_1 = 1$ month.

Using the following equations:

$$\Delta H_c = C'_c \cdot H_o \cdot \log \frac{\sigma_i}{\sigma_o} \quad \Delta H_\alpha = C'_\alpha \cdot H_o \cdot \log \frac{t_2}{t_1} \quad \Delta H = \Delta H_c + \Delta H_\alpha$$

Calculate the total settlement of the top of the landfill at the end of 4th month.

(16 marks)

- END OF QUESTION -