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UNIVERSITI TUN HUSSEIN ONN MALAYSIA

**FINAL EXAMINATION
SEMESTER I
SESSION 2016/2017**

COURSE NAME : SOIL MECHANICS AND FOUNDATIONS
COURSE CODE : BNP 20903
PROGRAMME : 2 BNA/BNB/BNC
DATE : DECEMBER 2016 / JANUARY 2017
DURATION : 3 HOURS
INSTRUCTIONS : ANSWER **FOUR (4)** QUESTIONS ONLY.

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THIS QUESTION PAPER CONSISTS OF **FOUR (4)** PAGES

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- Q1**
- (a) Give brief explanations on **TWO (2)** field exploration methods commonly used for site characterisation. (8 marks)
 - (b) Identify **FIVE (5)** operational requirements of drilling on site. (5 marks)
 - (c) Propose the steps you would take for a subsurface construction project. (7 marks)
 - (d) Briefly discuss the potential problems caused by poor management of groundwater above the excavation level, and propose a solution to the problems. (5 marks)
- Q2**
- (a) Briefly examine **THREE (3)** factors affecting lateral earth pressure. (6 marks)
 - (b) With the aid of suitable sketches, compare the following stress distribution analytical methods below:
 - (i) Using Fadum's chart. (3 marks)
 - (ii) The 1:2 method. (3 marks)
 - (c) Discuss in brief why there is no need for any support when making a vertical cut to the depth of $z = 2c/\gamma$ in a soil of $c = c$ and $\phi = 0$. Include the lateral earth pressure distribution diagram in the answer. (8 marks)
 - (d) A 5.5 m high vertical wall retains sand behind it. The sand ($\gamma = 18 \text{ kN/m}^3$) has a horizontal level and no water table is found on site. Using Rankine's Theory, determine the total lateral force P_A on the wall. Take $K_A = 0.323$. (5 marks)

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- Q3** (a) Sketch and briefly explain the **FOUR (4)** mechanisms of soil resisting stresses from a shallow foundation. (8 marks)
- (b) Examine **THREE (3)** factors influencing the choice of deep foundation. (6 marks)
- (c) Earth dams are constructed across rivers to hold back and store water in reservoirs. Propose **TWO (2)** earth dam designs using labelled sketches. (4 marks)
- (d) Calculate the Q_{ult} of a precast pile with the following data.
- Pile dimensions: 350 mm x 350 mm x 24 m long
 - Silty clay soil:

$c_u = 30$ kPa	(0-6 m)
$c_u = 32$ kPa	(6-12 m)
$c_u = 72$ kPa	(12-18 m)
$c_u = 75$ kPa	(18-24 m)
$c_u = 190$ kPa	(at pile tip)
 - Also given:

$$Q_p = N_c c_u A_p \quad \text{and} \quad Q_s = \sum fp\Delta L = \sum \alpha c_u p\Delta L$$
- Where, $N_c = 9$
 $\alpha = 0.95$ (0-12 m)
 $\alpha = 0.62$ (12-24 m)
- (7 marks)

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- Q4** (a) Outline **THREE (3)** common causes and consequences each of geotechnical failures. (6 marks)
- (b) Examine **THREE (3)** main disadvantages of the vibro-floatation method. (6 marks)
- (c) There is a wide selection of surface compaction methods available in the market. Identify and explain **FOUR (4)** main considerations for choosing the suitable method. (8 marks)
- (d) Briefly propose how effective reinforcement can be achieved from the interaction between geosynthetic materials and soils. (5 marks)
- Q5** (a) Illustrate how subsurface contamination takes place and affects the groundwater quality. (5 marks)
- (b) With a detailed sketch, show the possible contamination pathways of a waste dump. (10 marks)
- (c) Suggest **FIVE (5)** waste material reuse efforts for waste reduction purposes. (5 marks)
- (d) Vertical barriers are commonly used to control the movement of contaminants. Put forward the primary requirements of an ideal containment system. (5 marks)

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- END OF QUESTIONS -