UTHM
Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER I
SESSION 2014/2015

COURSE NAME	:	SOIL MECHANICS AND FOUNDATIONS
COURSE CODE	:	BNP 20903
PROGRAMME	:	BNA/BNB/BNC
DATE	:	DECEMBER 2014 / JANUARY 2015
DURATION	:	3 HOURS
INSTRUCTIONS	:	ANSWER **FOUR (4)** QUESTIONS ONLY.

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

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) Examine the **FIVE (5)** factors to be considered in the estimation of soil's settlement.

(5 marks)

(b) In your own words, define the **FIVE (5)** Bearing Capacity Factors used to improve Terzaghi's equation.

(10 marks)

(c) Differentiate the conditions of a footing seated on sand and clay for strength parameters selection.

(5 marks)

(d) A 7 m high vertical wall has sand ($\gamma = 18.5$ kN/m^3) behind it. The level of the sand is horizontal and there is no water table at the site. Using Rankine's Theory, determine the total lateral force P_A on the wall. Also given is $K_A = 0.333$.

(5 marks)

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 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   (0-12 m)
$c_u = 75$ kPa   (12-24 m)
$c_u = 210$ 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)

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 or stone column methods.

(6 marks)

(c)   There is a wide selection of surface compaction methods available in the market. Identify and explain **FOUR (4)** main considerations when deciding on the suitable method.

(8 marks)

(d)   Briefly compose the interaction between geosynthetic materials and soils for effective reinforcment of the soil.

(5 marks)

Q5   (a)   Demonstrate 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)   Propose **FIVE (5)** waste materials reuse for waste reduction purposes.

(5 marks)

(d)   Vertical barriers are commonly used to control the movement of contaminants. Examine the primary requirements of an ideal containment system.

(5 marks)

- END OF QUESTION -