

POLITEKNIK
Jabatan Pengajian Politeknik

EXAMINATION AND EVALUATION DIVISION
DEPARTMENT OF POLYTECHNIC EDUCATION
(MINISTRY OF HIGHER EDUCATION)

CIVIL ENGINEERING DEPARTMENT

FINAL EXAMINATION
JUNE 2012 SESSION

CC502 : GEOTECHNICS 2

DATE : 22 NOVEMBER 2012
DURATION : 2 HOURS (8.30 -10.30 AM)

This paper consists of **EIGHT (8)** pages including the front page.

Section A: Essay (1 questions – answer **ALL**)

Section B: Essay (5 questions – answer **3** questions)

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THE CHIEF INVIGILATOR

(The CLO stated is for references only)

SECTION A (COMPULSORY)**ESSAY QUESTION (25 marks)****INSTRUCTION:**

This section consists of **ONE (1)** essay question only. You are required to answer the question.

QUESTION 1

- a) State **FIVE (5)** objectives of Site Investigation. [CLO 1]
(5 marks)
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- b) Explain briefly the following stages of Site Investigation. [CLO 1]
- i. Site Reconnaissance (3 marks)
 - ii. Planning a site investigation (3 marks)
 - iii. Ground Exploration (3 marks)
 - iv. Laboratory Test (3 marks)
- c) Give **FOUR (4)** advantages and **FOUR (4)** common errors in conducting the Probe Mackintosh Test. [CLO 1]
(8 marks)

SECTION B

ESSAY QUESTION (75 marks)

INSTRUCTION:

This section consists of **FIVE (5)** essay questions. Answer **THREE (3)** questions only.

QUESTION 1

- a) Figure 1 shows a sheet piling in a sandy soil impounding upstream water. If the coefficient of permeability (k) is 7.2×10^{-3} mm/sec: [CLO 2]
- Redraw the diagram using an appropriate scale and plot the flow net. It must contain equipotential lines, N_e and flow lines, N_f .
 - Determine the quantity of seepage, Q in $\text{m}^3/\text{hour}/\text{m}$ length.
 - Calculate the pore water pressure at point P.

(18 marks)

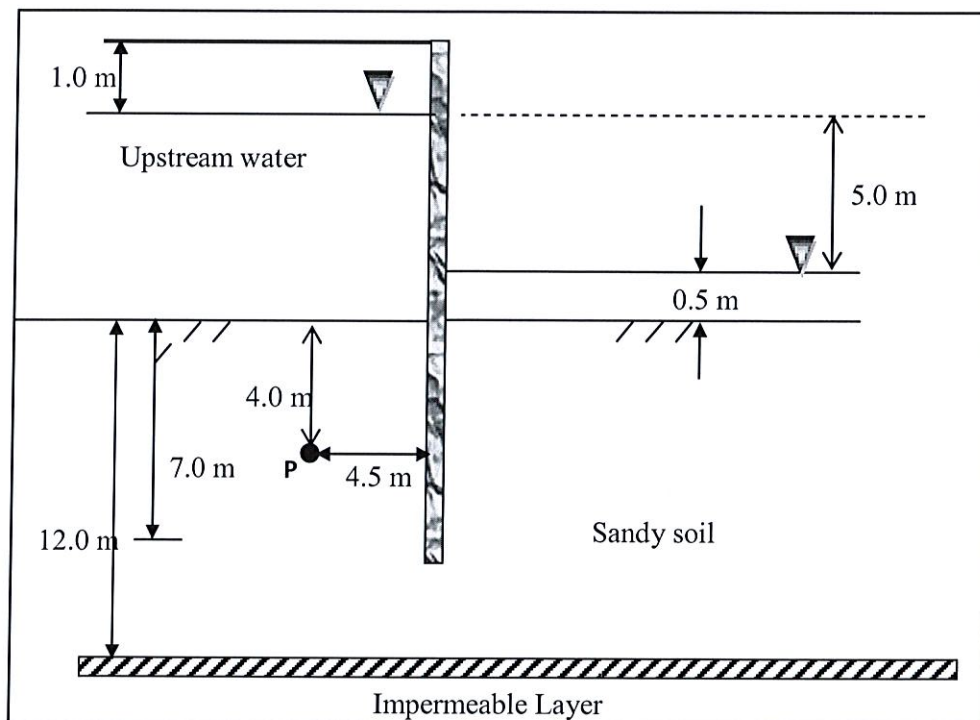


Figure 1

- b) Determine factor of safety against sliding shown in Figure 2 using the Total Stress Analysis Method.

[CLO2]

(7 marks)

Given:

$$\gamma = 18 \text{ kN/m}^3$$

$$c = 35 \text{ kN/m}^2$$

$$A = 175 \text{ m}^2$$

$$\theta = 83.1^\circ$$

$$\phi = 0$$

$$d = 7.3 \text{ m}$$

$$R = 22.83 \text{ m}$$

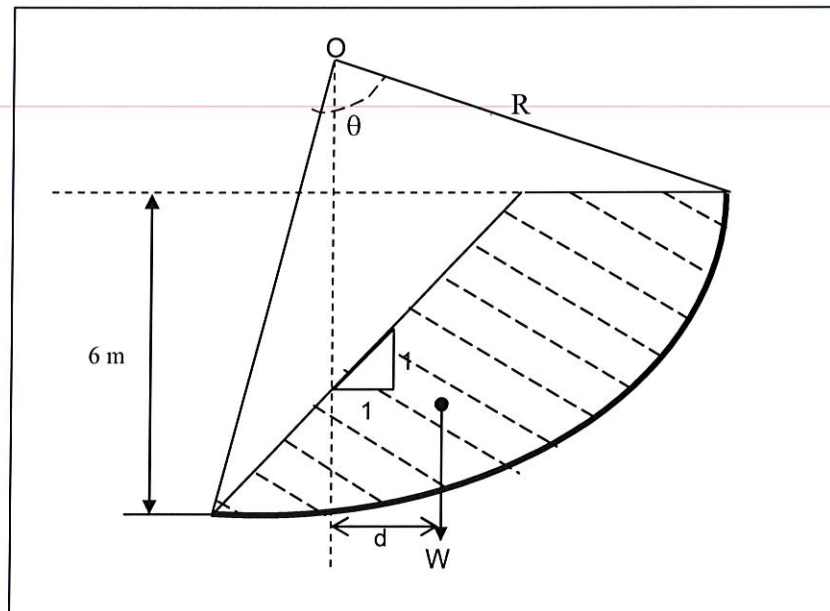
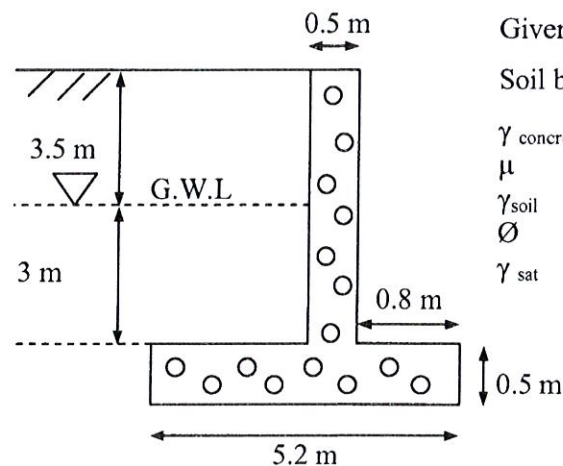


Figure 2

QUESTION 2

- a) State **TWO (2)** types of retaining wall [CLO 2]
(2 marks)
- b) Rankine (1857) had developed a theory to calculate the lateral active and passive pressure. Give **THREE (3)** assumptions from the Rankine theory. [CLO 2]
(3 marks)
- c) Analyze the safety factor of the maximum bearing capacity for the cantilever retaining wall as shown in Figure 3. [CLO2]
(20 marks)



Given:

Soil bearing capacity = 215 kN/m^2 $\gamma_{\text{concrete}} = 24 \text{ kN/m}^3$ $\mu = 0.70$ $\gamma_{\text{soil}} = 19 \text{ kN/m}^3$ $\phi = 20^\circ$ $\gamma_{\text{sat}} = 21 \text{ kN/m}^3$

Figure 3

QUESTION 3

- a) Foundation normally refers to something that supports a structure such as column or wall, along with the loads carried by the structure. State **THREE (3)** main design criterias to be considered for a concrete footing. [CLO 1]
(6 marks)
- b) Name and sketch **THREE (3)** types of shallow foundation. Give a short explanation for each. [CLO 1]
(9 marks)
- c) Explain the **FIVE (5)** successive steps that the design engineer must perform in choosing the type of foundation. [CLO 2]
(10 marks)

QUESTION 4

- a) Sketch **TWO (2)** types of soil shear failure mode and explain them briefly.

[CLO 2]

(10 marks)

- b) A square footing (2m x 2m) is located at a depth of 5m below the ground surface to distribute the load from the structure. The parameters of the soil are given below;

[CLO2]

Unit weight of soil, γ	19 kN/m ³
Unit weight of saturated soil, γ_{sat}	21 kN/m ³
Cohesion of soil, C	55 kN/m ²
Friction angle of soil, ϕ	15°
Ground water level, GWL	Water table at the surface of soil

Calculate;

- the ultimate bearing capacity of the soil
- the factor of safety (SF) if the design load from the structure, Q is 1500kN.

(15marks)

QUESTION 5

- a) State and explain the meaning of the formula for the ultimate Bearing Capacity of pile and pile foundation. [CLO2]
(5 marks)
- b) State **THREE (3)** reasons why Pile Load Test is required for the design of piles. [CLO2]
(6 marks)
- c) Piles are classified according to various criteria. List **TWO (2)** types of piles for each of the following criteria;
i. Pile Installation Method
ii. Load Transfer Method [CLO 2]
(4 marks)
- d) Explain briefly the bearing capacity of piles. [CLO 2]
(5 marks)
- e) Explain *Negative Skin Friction* with the aid of a diagram. [CLO 2]
(5 marks)

