



PROGRAM : BACHELOR CIVIL ENGINEERING

SUBJECT : **GEOTECHNICAL ENGINEERING 3A**

CODE : **GTG3A11 / GTGCIA3**

DATE : EXAMINATION
JUNE 2019

DURATION : 12:30 - 15:30

WEIGHT : 50: 50

TOTAL MARKS : 100

ASSESSOR : PROF. M. FERENTINOU

MODERATOR : PROF. F. N. OKONTA

NUMBER OF PAGES : 3 PAGES, 1 APPENDIX, GRAPH PAPER,

INSTRUCTIONS : ONLY ONE POCKET CALCULATOR PER CANDIDATE MAY
BE USED.
QUESTIONS PAPERS MUST BE HANDED IN.
ANSWER ALL QUESTIONS.
COMPLETE THE FRONT PAGE OF THE EXAMINATION
BOOKLET CORRECTLY WITH RESPECT TO DETAILS
CONCERNING YOUR, STUDENT NUMBER, DATE, AND
QUESTIONS ANSWERED.

Note: You are required to show how your answers are obtained graphically by means of either neat approximate plots and analytically derived answers.

QUESTION 1

[25 marks]

Results from a compaction test are given in the table below:

Soil 1

| Compaction test | | Moisture content test | | |
|-----------------|-----------------------|-----------------------|---------------------|---------------------|
| Mould (kg) | Mould + Wet Soil (kg) | Tin (kg) | Tin + Wet Soil (kg) | Tin + Dry Soil (kg) |
| 4.61 | 8.41 | 0.31 | 1.07 | 1.05 |
| 4.61 | 8.97 | 0.31 | 1.18 | 1.14 |
| 4.61 | 9.41 | 0.31 | 1.27 | 1.21 |
| 4.61 | 9.63 | 0.31 | 1.31 | 1.23 |
| 4.61 | 9.59 | 0.31 | 1.31 | 1.21 |
| 4.61 | 9.36 | 0.31 | 1.26 | 1.15 |
| 4.61 | 9.12 | 0.31 | 1.21 | 1.09 |

Volume of mould = 2305 cm^3

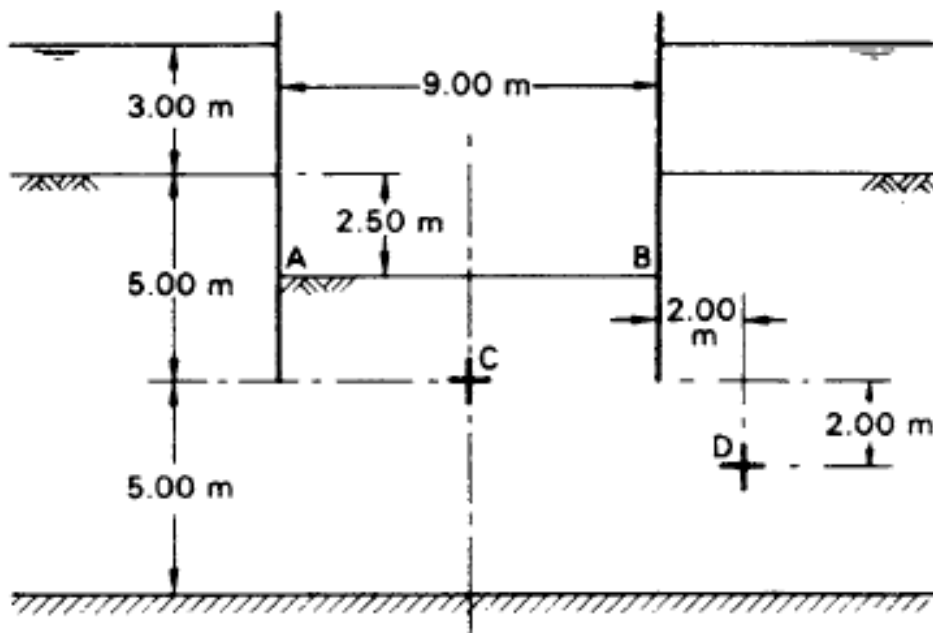
Soil specific gravity = 2.60

Determine the maximum dry density and optimum moisture content.

QUESTION 2

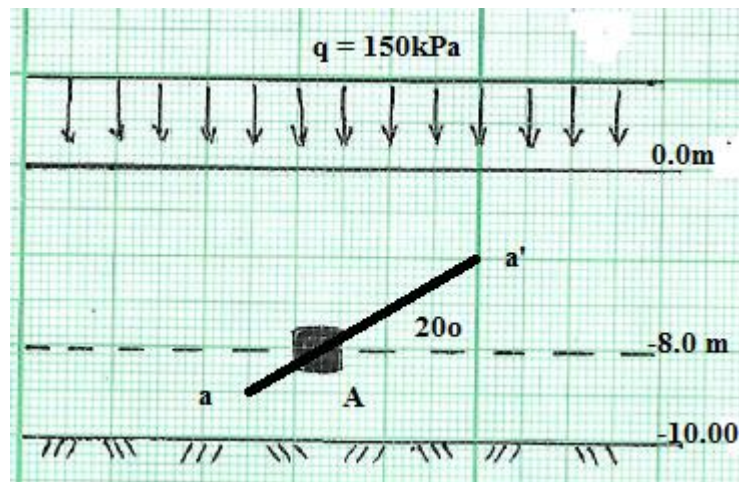
[25 marks]

The cross section through a long coffer dam is given in the figure below. The coefficient of permeability of the soil is $4.0 \times 10^{-7} \text{ m/sec}$. Draw the flow net, determine the quantity of seepage entering the cofferdam and determine the pressure head at points C, and D.



QUESTION 3**(25 MARKS)**

Given the figure below find i) graphically and ii) analytically, the normal and the shear stress acting on plane a-a', ($\rho = 1.7 \text{ Mg/m}^3$, $K_o = 0.5$).

**QUESTION 4****(25 MARKS)**

A soil profile is shown in the figure below. If a uniformly distributed load $\Delta\sigma$ is applied at the ground surface, what is the settlement of the clay layer caused by primary consolidation if a. the clay is normally consolidated, b. the preconsolidation pressure, $\sigma_c' = 200 \text{ kN/m}^2$ $C_s = 1/5 C_c$. Calculate and plot a graph of e vs σ' at the beginning and end of the consolidation.

