UNIVERSITY OF MINES AND TECHNOLOGY, TARKWA

SECOND SEMESTER EXAMINATIONS, MAY 2018

COURSE NO: GL 222
COURSE NAME: **ROCK and SOIL MECHANICS**
CLASS: **GD II** TIME: 3 HOURS

Name: _____ Index Number: _____

Q1a. Prove that, vertical and horizontal forces acting on a block of rock will produce a shear stress with the equation $\tau = \sigma_n \tan \phi$

(10 marks)

Q1b. The dry density of a sand with porosity of 0.387 is 1600kg/m^3. Find the void ratio of the soil and the specific gravity of the soil solids. (Take ρ_w = 1000kg/m^3).

(15 marks)

Q2a. If a soil sample has a dry unit weight of 19.5 kN/m^3, moisture contain of 8% and specific gravity of solids particles is 2.67. Calculate for:

a. The void ratio
b. Moisture and saturated unit weight
c. The mass of water to be added to cubic metre of soil to reach 80% saturation.

(15 marks)

Q2b. Name and explain factors that determine the nature and state of a soil. (10 marks)

Q3a. Provide the meaning of the soil classification symbols below.

i. CL, ii. ML, iii. OH, iv. GW, v. SW, (5 marks)

Q3b. Define the following terms:

a. D_{60}
b. Uniformity coefficient
c. Liquid limit
d. Porosity
e. Dry unit weight
f. Plasticity index
g. Water Content
h. Void ratio
i. Buoyant unit weight
j. Curvature coefficient (20 marks)

Q4a Name and sketch four possible failures that can occur in soils. (6 marks)

Q4b. Give four limitations to the use of the shear box test. (4 marks)

Q4c. What is the shear strength in terms of effective stress on a plane within a saturated soil mass at a point where the total normal stress is 295 kN/m^2 and the pore water pressure is 120kN/m^2 .

The effective stress parameters for the soil are c' = 12kN/m^2 and $\phi' = 30^o$.

(15marks)

Examiners: E B. Fiadonu*/M. Affam*

Useful Formulas

$$V_{total} = V_{solid} + V_{voids} \rightarrow V_{total} = V_{solid} + V_{air} + V_{water}$$

$$W_{total} = W_{solid} + W_{water} \rightarrow (W_{air} = 0 \ , \ W_{solid} = W_{dry})$$