



MACHAKOS UNIVERSITY

University Examination 2018/2019

SCHOOL OF ENGINEERING AND TECHNOLOGY
DEPARTMENT OF BUILDING AND CIVIL ENGINEERING
SECOND YEAR SECOND SEMESTER EXAMINATION FOR
DIPLOMA IN CIVIL ENGINEERING
BCECD 217: SOIL MECHANICS 1

DATE: 9/5/2019

TIME: 8:30 – 10:30 AM

INSTRUCTIONS

- i) Question one is compulsory and carries 30mks
- ii) Answer Any other Two questions

1. a) With the aid of a diagram explain the three types of clay mineral structures (6 marks)
- b) Explain the following soil properties
- i) Void ratio
 - ii) Porosity
 - iii) Specific gravity
 - iv) Moisture content
 - v) Unit weight
 - vi) Degree of saturation
 - vii) Bulk density (14 marks)
- c) Give three factors that affect soil compaction (6 marks)
- d) Explain the following attenberg limits
- i) Plastic limit
 - ii) Liquid limit (4 marks)

2. a) Prove the following soil relationships (4 marks)
- $$S = \frac{WGs}{e}$$
- b) The mass of a wet sample of soil and its container is 0.33kg. The dry mass of soil and its container is 0.29kg. The mass of the container is 0.06 and its volume is $0.15 \times 10^{-3} \text{m}^3$. Determine the following: -
- The bulk, dry and saturated unit weight of the soil.
 - The void ratio and degree saturation
 - How much air voids is in the field
 - The weight of water required to saturate 1m^3 of the soil (16 marks)
3. a) Describe with an aid of a diagram the three types of crystalline clay minerals (6 marks)
- b) Describe how soil classification is done on the particle size distribution (14 marks)
4. a) Describe the soil identification in the field (14 marks)
- b) Give two reasons for soil classification (4 marks)
- c) Name two systems used in soil classification (2 marks)
5. In its natural condition a soil sample has a mass of 2290g and a volume of $1.15 \times 10^{-3} \text{m}^3$. After being completely dried in an oven the mass of the sample is 2035g, the value of G_s for the soil is 2.68. Determine
- Bulk density
 - Unit weight
 - Water content
 - Void ratio
 - Porosity
 - Degree of saturation
 - Air content (20 marks)