MACHAKOS UNIVERSITY COLLEGE

(A Constituent College of Kenyatta University)
University Examinations for 2015/2016

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 I

Date: 20/4/2016 **Time: 8:30-10:30 am**

Instructions:

- *This paper comprises of **five** questions*
- *Question **one** is **compulsory** and carry 30 marks*
- *Answer any **other two** questions*

1. A sample of soil weighing 30.6 kg had a v0lume 0.0183m^3.When dried out in an oven its weight was reduced to 27.2 kg. The specific gravity of the solids was found to be2.65. Determine the following
   a) Bulk density
   b) Dry density
   c) Percentage moisture content
   d) Saturated density
   e) Void ratio
   f) Porosity
   g) Degree of saturation
   h) Critical hydraulic gradient (30 marks)

2 (a) A proctor compaction test was carried out on a soil whose grains have a specific gravity of 2.6.The mass and moisture content of the compacted soil were 1500g

and 25% respectively. If the diameter of the mould was 100mm an height was 110mm .determine the following properties of the soil.

i. Void ratio
ii. Dry density(p_d)
iii. Degree of saturation(S_r) (12 marks)

(b) Define each of the following terms.

i. Void ratio
ii. Porosity
iii. Degree of saturation
iv. bulk density (8 marks)

3. (a) Show from 1st principles that the void ratio e of a soil is related to unit weight of water (γ_w),particle specific gravity (Gs),moisture content(w) and bulk unit weight (γ_b) by an expression of the form:

$$e = \frac{\gamma_w Gs(1+w)}{\gamma_b} - 1$$

(14 marks)

(b) The saturated unit weight and moisture content of a soil are 18.15KN/m^3 and 22% respectively. Using 1st principles determine void ratio of the soil. (6 marks)

4 (a) Define soil structure. (2 marks)

(b) With sketches, explain the four principal forms of soil structure. (16 marks)

(c) List any two soil classification systems used in soil classification (2 marks)

5. Describe briefly the origins of soils and summarise the factors which control their formation. (20Marks)