



MACHAKOS UNIVERSITY

University Examinations 2017/2018

SCHOOL OF ENGINEERING
DEPARTMENT OF BUILDING AND CIVIL ENGINEERING

SECOND YEAR SECOND SEMESTER EXAMINATION FOR DIPLOMA IN CIVIL
ENGINEERING

BCECD 217: SOIL MECHANICS I

DATE: 18/12/2017

TIME: 8.30-10.30 AM

INSTRUCTIONS

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

- 1 a) Define the following properties of soil
- i Porosity
 - ii Degree of saturation
 - iii Void ratio
 - iv Moisture content
 - v Specific gravity (10 marks)
- b) Show that bulk density, γ_b is given by the expression $\gamma_b = \frac{\gamma_w}{1+e} (G_s + W G_s)$ (8 marks)
- c) Briefly describe **four** types of transported soils citing at least **one** example in each case (12 marks)
- 2 a) Define the term 'Permeability of soils' (1 mark)
- b) Explain **four** factors affecting soil compaction (8 marks)

- c) In a compaction test conducted on a unit volume of soil sample, proof that dry density, $\gamma_d = \frac{G_s \gamma_w}{1 + m G_s} (1 - V_a)$ (11 marks)
- 3 a) Define the term ‘Soil consistency’ (1 mark)
- b) State **four** methods of soil classification (4 marks)
- c) Describe the procedure of carrying out the sieve analysis test (7 marks)
- d) Using a graphical representation, explain the relationship between the following soil consistency limits as applied to in classifying cohesive soils.
- i Liquid limit
 - ii Plastic limit
 - iii Shrinkage limit (8 marks)
- 4 A laboratory test carried out on an undisturbed sample of soil weighing 1.74kg and having a volume of 0.001m^3 determined the specific gravity of solids to be 2.6 and the dry density of the soil to be 1500kg/m^3 .
- Calculate;
- i The moisture content
 - ii The void ratio
 - iii The saturated density
 - iv The submerged density
 - v The degree of saturation of the soil sample (20 marks)
- 5 a) State **two** causes of ‘Quick sand’ condition in soils (2 marks)
- b) Explain **two** factors affecting permeability in soils (4 marks)
- c) Using a relevant sketch, explain the constant head permeameter test as used to determine the coefficient of permeability, k for coarse grained soils having values of k above 10^{-4}m/s . (14 marks)