



TECHNICAL UNIVERSITY OF MOMBASA

SCHOOL OF ENGINEERING AND TECHNOLOGY
 Department of BUILDING & Civil engineering
UNIVERSITY EXAMINATION FOR:

BACHELOR OF **SCIENCE** IN CIVIL ENGINEERING
ECV 4515 : GEOTECHNICAL ENGINEERING

SPECIAL/SUPPLEMENTARY EXAMINATION
SERIES: MARCH 2025

TIME: 2 HOURS

Instructions to Candidates

You should have the following for this examination

-Answer Booklet, examination pass and student ID

This paper consists of **five** questions.

Attempt question ONE (Compulsory) and any other TWO questions.

Do not write on the question paper.

QUESTION ONE (COMPULSORY)

(30 Marks)

- a) Discuss two types of embankment dams. **(8marks)**
- b) A soil sample, in its natural condition, has a mass of 2.29 kg and a volume of $1.15 \times 10^{-3} \text{ m}^3$. After oven drying, the mass of the sample is 2.035 kg. Specific gravity (GS) is 2.68.
 Determine the following;
- i) Bulk density
 - ii) Water content
 - iii) Void ratio
 - iv) Porosity
 - v) Degree of saturation. **(7marks)**
- c) i) Outline the objectives of in-situ field testing. **(2marks)**
 ii) Using illustrations, discuss soil phases. **(5marks)**
- d) Discuss “Frost Action” in soils and how it can be mitigated. **(8marks)**

ANSWER ANY TWO QUESTIONS FROM THIS SECTION

QUESTION TWO

(20 Marks)

- a) Using illustrations, explain the following geotechnical structural terms;
- i) Bedding planes (2marks)
 - ii) Faults (2marks)
 - iii) Folds (2marks)
 - iv) Joints (2marks)
 - v) Dykes (2marks)
- b) A sample of saturated clay has a mass of 1.526 kg. and a dry mass of 1.053kg. The specific gravity of the solid particles is 2.7. For the sample, determine;
- i) Water content
 - ii) Void ratio
 - iii) Porosity
 - iv) Total density. (8marks)
- c) Give examples of cohesion less soils. (2marks)

QUESTION THREE (20 Marks)

- a) Discuss residual soils. (10marks)
- b) Outline the factors affecting the choice of a dam site. (10marks)

QUESTION FOUR

(20 Marks)

- a) A moist sample of soil has a volume of 464cm^3 in its natural state and weighs 793g. The dry weight is 735g and has a specific gravity of 2.68. For the sample, determine;
- i) Void ratio
 - ii) Porosity
 - iii) Water content
 - iv) Degree of saturation. (6marks)
- b) Discuss **four (4)** types of Geo-synthetics. (10marks)
- c) Outline the main uses of a dam. (4marks)

QUESTION FIVE

(20 Marks)

- a) Outline the objectives of ground investigation. (6marks)
- b) Outline the factors affecting tunnel construction standup time. (8marks)
- c) Discuss the purposes of Tunneling. (6marks)