



**MASEÑO UNIVERSITY**  
**UNIVERSITY EXAMINATIONS 2013/2014**

**SECOND YEAR FIRST SEMESTER EXAMINATIONS FOR THE  
DEGREE OF BACHELOR OF SCIENCE IN SOIL SCIENCE AND  
BACHELOR OF SCIENCE IN AGRONOMY WITH INFORMATION  
(MAIN CAMPUS)**

**ASS 201: SOIL PHYSICS**

*Date: 27<sup>th</sup> November, 2013*

*Time: 8.30 - 10.30am*

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**INSTRUCTIONS:**

- Answer QUESTION ONE and ANY other TWO questions.

**INSTRUCTIONS:**

This paper comprises sections A and B.

Answer ALL questions in section A and any TWO questions in section B.

**SECTION A**

1. Define the following terms as used in soil physics.

- a) Soil texture
- b) Soil textural class
- c) Field capacity
- d) Permanent wilting point

( 8 marks)

2 a) Describe the hydrometer method of determination of soil texture.

(6 marks)

- b. In a soil analysis exercise the 1<sup>st</sup> soil hydrometer reading was 38 g l<sup>-1</sup> and the 2<sup>nd</sup> reading was 18 g l<sup>-1</sup>. A 50 g soil sample was used. Identify the textural class of the soil. Show how you arrive at the answer (The textural triangle is given).

(5 marks)

Q3. A soil specimen with a volume of 60.0 cm<sup>3</sup> has a mass of 105.0 g. Its dry mass is 80.2 g and particle density is 2.65 g/cm<sup>3</sup>. Determine the following soil characteristics:

- a. Gravimetric water content in %.
- b. Bulk density
- c. Porosity
- d. void ratio
- d. Degree of saturation

(2 marks)

(2 marks)

(2 marks)

(2 marks)

(2 marks)

Q4 a) Explain the harmful effects of high bulk density on plant growth.

(3 marks)

b) State and explain any four factors that affect soil porosity.

(4 marks)

Q5) To perform a field calibration of a neutron meter, one must take a reading with the meter in a particular volume of soil and then sample that soil and determine the *volume wetness* of the soil. If you were required to calibrate a neutron meter, how would you measure the volume wetness of the soil (tell what measurements and what calculations you would need to make)?

(4 marks)

**SECTION B: Answer any two questions**

- 6a) Compare and contrast saturated and unsaturated flow in soil. (6 marks)
- c) The cross-sectional area of the soil is  $10 \text{ cm}^2$ , and the outflow is  $30 \text{ cm}^3 / \text{hr}$ . What is the saturated hydraulic conductivity ( $K_s$ ) of the soil if the hydraulic gradient is 0.57? (4 marks)
- d) Give the water balance equation and explain the terms used therein. (5 marks)
- 7 a) Define the term soil water potential. (2 marks)
- b) The water infiltration rate into soil invariably slows from the initial application of water until the final water entry. Explain why this occurs. (3 marks)
- c) Describe the components of the total soil-water potential. (10 marks)
- 8 a) State Fourier's law on heat flow and hence give an appropriate equation that describes heat flux in soils. (5 marks)
- b) Discuss the factors that influence the soil temperature. (10 marks)

# Soil Textural Triangle

