



EGERTON

UNIVERSITY

UNIVERSITY EXAMINATIONS

NJORO CAMPUSSECOND SEMESTER 2011/2012

FIRST YEAR EXAMINATIONS FOR THE DEGREE OF BACHELOR OF SCIENCE IN
AGRICULTURAL ENGINEERING

AGEN 200: PHYSICS OF THE PLANT ENVIRONMENTSTREAM: 2011 (Y1) AGENTIME: 2 hoursDAY/TIME: Thursday, 08.30 – 10.30 amDATE: 03-05-2012**INSTRUCTIONS:**

1. The paper consists of **FIVE (5)** questions.
2. Attempt **ANY FOUR** questions.
3. All questions carry equal marks.
4. Marks for each question are shown in parenthesis.
5. Show all your work on the answer sheet and indicate any assumptions made for calculation.
6. **EACH QUESTION SHOULD BE STARTED ON A NEW PAGE.**

QUESTION ONE

- (a) Explain **THREE** major functions of soil. (6 marks)
- (b) A moist sample of soil in a can had a mass of 25.24 g and the can when empty has a mass of 14.2 g. After drying in an oven for 24 hours, the can and soil sample had a mass of 21.62 g. Determine the water content of the soil. (5 marks)
- (c) Explain the following terms as related to soil.
- (i) Soil fertility. (3 marks)
 - (ii) Soil productivity. (3 marks)
 - (iii) Soil consistence. (3 marks)
 - (iv) Soil friability. (3 marks)
 - (v) Soil tilth. (2 marks)

QUESTION TWO

- (a) A soil sample has a water content of 27 per cent and a bulk density of 1.97 Mg/m^3 . Determine the following for this soil sample:
- (i) Dry density. (6 marks)
 - (ii) Void ratio. (6 marks)
 - (iii) Specific gravity of soil particle. (3 marks)
- (b) (i) Distinguish between **SOIL TEXTURE** and **SOIL STRUCTURE**. (4 marks)
- (ii) Explain the physical, chemical and biological importance of soil organic matter. (6 marks)

QUESTION THREE

- (a) Explain **THREE** types of soil water (9 marks)
- (b) With the aid of a diagram, explain the relationship between adhesion and cohesion water with respect to soil particles and pore space. (6 marks)
- (c) Discuss **FIVE** factors that affect the moisture holding capacity of soil. (10 marks)

QUESTION FOUR

- (a) (i) Explain the concept of soil water potential. (5 marks)
- (ii) Name and discuss **THREE** types of soil water potential. (10 marks)
- (b) Define the following classifications of soil water.
- (i) Field Capacity (FC). (2 marks)
 - (ii) Permanent Wilting Point (PWP). (2 marks)
 - (iii) Available Water Capacity (AWC). (2 marks)
- (c) Define the term '**infiltration**' in soil and name **FOUR** factors that influence the infiltration capacity of a soil. (4 marks)

QUESTION FIVE

- (a) With the aid of a diagram (graphs) show and explain the soil moisture suction curves for **THREE** representative mineral soils. (6 marks)
- (b) List and explain **THREE** conditions under which evaporation process can occur from a bare soil surface. (3 marks)
- (c) Express the following in terms of the specific gravity of the particles (G_s), the void ratio (e), the degree of saturation of the voids (S_r), and the density of water (ρ_w).
- (i) Bulk density. (2½ marks)
 - (ii) Saturated density. (2½ marks)
 - (iii) Dry density. (2½ marks)
 - (iv) Submerged density of a soil (2½ marks)
- (d) Explain the following terms.
- (i) Liquid limit. (2 marks)
 - (ii) Plastic limit. (2 marks)
 - (iii) Plasticity Index. (2 marks)
