

CHUKA



UNIVERSITY

UNIVERSITY EXAMINATIONS

**EXAMINATION FOR THE AWARD OF MASTER OF SCIENCE IN DRYLAND
AGRICULTURE**

AGEN 849: SOIL CONSERVATION AND WATER MANAGEMENT

STREAMS: MSc (DRY LAND AGRICULTURE)Y1S2

TIME: 3 HOURS

DAY/DATE: TUESDAY 18/4/2023

11.30 A.M. – 2.30 P.M.

**INSTRUCTIONS: ANSWER ALL QUESTIONS IN SECTION A (20 MARKS) ANY
OTHER TWO IN SECTION B (40 MARKS)**

SECTION A

QUESTION ONE

- a) Explain the categories of soil salinity that can negatively affect plant growth and crop yields. (4 marks)
- b) Explain how Elemental Sulfur is used to reclaim calcareous-sodic soils. (6 marks)

QUESTION TWO

- a) Illustrate a simplified version of nutrient cycling in natural and agricultural systems. (6 marks)
- b) Derive the Poiseuille's law of water flow in a tube. (4 marks)

SECTION B

QUESTION THREE

- a) Explain the similarities between saturated and unsaturated flow in soils (8 marks)

- b) Explain advection and dispersion as applied in transportation of pollutants/chemicals in soils. (6 marks)
- c) Explain the ways in which you would apply to prevent water contamination or at least limit your contribution to it. (6 marks)

QUESTION FOUR

- a) Discuss the role of agriculture in eutrophication. (6 marks)
- b) Illustrate the energy differentials that drive the water movement from the soil into the roots, up the stalk, into the leaves and out into the atmosphere. (8 marks)
- c) Explain the primary sources of excess nitrogen and phosphorus in the environment. (6 marks)

QUESTION FIVE

- a) Crop residue absorbs raindrop impact and keeps the wind off the soil surface. Discuss. (6 marks)
- b) Calculate the irrigation water need (IN) of paddy rice for the month of September when given: (38 marks)
- ☐ $E_{To} = 7\text{mm/day}$
 - ☐ $K_c = 0.6$
 - ☐ The root zone has already been saturated in the previous month
 - ☐ $PERC = 4.3\text{mm/day}$
 - ☐ The water layer (100mm) needs to be established during September
 - ☐ $P_e = 128\text{mm/month}$
- c) Explain any SIX (6) advantages of land use planning in agro-ecological systems.(6 marks)
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