



(The University of choice)

**MASINDE MULIRO UNIVERSITY OF
SCIENCE AND TECHNOLOGY
(MMUST)**

**UNIVERSITY EXAMINATIONS
2023/2024 ACADEMIC YEAR**

**YEAR THREE SEMESTER ONE EXAMINATIONS
(Main examination)**

**BACHELOR OF SCIENCE IN AGRIBUSINESS MANAGEMENT,
BACHELOR OF SCIENCE IN AGRICULTURAL ECONOMICS
AND RESOURCE MANAGEMENT**

COURSE CODE: AEN 303

COURSE TITLE: IRRIGATION AND DRAINAGE

DATE: 23RD April, 2024

TIME: 11:30-2:30 PM

Instructions: This paper consists of 5 questions

Section A is compulsory, Answer any 3 questions from Section B

Observe the regulations governing clarity in expression of your
answers

SECTION A (25 marks)

Question One

(a) Outline the site considerations to be followed when selecting an irrigation method **(4 marks)**

(b) Differentiate between Field Capacity and Permanent Wilting Point and hence state their significance in irrigation **(3 marks)**

(c) Define and state the significance of the following terms

- i. ET
- ii. ET_o
- iii. ET_c
- iv. ET_b

(4 marks)

(d) Describe the following types of soil moisture

- i. Hygroscopic
- ii. Capillary
- iii. Gravitational
- iv. Water vapour

(4 marks)

Question Two

(a) With respect to irrigation requirements, state the different categories of crops **(4 marks)**

(b) State the factors that influence evapotranspiration **(3 marks)**

(c) Differentiate between salinity and sodicity **(2 marks)**

(d) Describe the hydrological cycle, hence state the component therein that are useful for irrigation **(3 marks)**

SECTION B (45 marks)

Question Three

(a) Differentiate between a confined and an unconfined aquifer **(3 marks)**

(b) Briefly discuss the theory behind infiltration **(7 marks)**

(c) Outline the features of a sprinkler irrigation system **(5 marks)**

Question Four

- (a) State the Penman Monteith equation, and hence give its elements
(6 marks)
- (b) Describe how the following soil physical properties influence the irrigation regime for a crop
i. Soil layers
ii. Soil texture
iii. Soil structure
(3 marks)
- (c) Draw and show the components of a typical drip irrigation system
(6 marks)

Question Four (15 marks)

- (a) Explain how the following systems are used in the computation of ET
i. Weather station
ii. Evaporation pan
(8 marks)
- (b) Describe the elements of the field method used in determination of soil moisture
(4 marks)
- (c) With the aid of a diagram, outline the features of a centrifugal pump
(3 marks)

Question Five (15 marks)

- (a) Briefly explain the principle behind irrigation scheduling, hence state the importance of irrigation scheduling
(6 marks)
- (b) During field evaluation, the soil moisture content at the time of soil sampling before irrigation were 10% by weight and the field had the following characteristics;

Given Data:

Application Efficiency (Ea)	65%
Field Capacity (FC)	20% by weight
Permanent Wilting Point (PWP)	7% by weight
Bulk Density (BD)	1.8 g/cm ³
Root Zone Depth (D)	75 cm
MAD	80% of Available Moisture
Soil Moisture at Sampling	10% by weight

Required:

- i. Total Depth of Available Water in the Root Zone (AM)
- ii. Moisture Deficiency at the root zone at the time of sampling
- iii. Depth of water to be applied at PWP
- iv. Depth of water to be applied at sampled moisture content
- v. Depth to be Applied at MAD
- vi. Number of days the farmer can delay the irrigation before PWP, if daily consumptive use is 4 mm/day. **(9 marks)**