



(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) ODEL**

BACHELOR OF SCIENCE IN AGRICULTURE AND BIOTECHNOLOGY

COURSE CODE: AEN 303

COURSE TITLE: IRRIGATION AND DRAINAGE

DATE: 7th Dec, 2023

TIME: 8 - 10 AM

Instructions: This paper consists of 5 questions

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

Observe the regulations governing clean drawing production

irrigation weighs 1.73 kg, and the soil collected just after irrigation weighs 1.94 kg. Both soils are placed in an oven and dried at 100 C for 24 hours. After drying, the soil collected just before irrigation weighs 1.49 kg and the soil collected just after irrigation weighs 1.52 kg. What are the volumetric water contents just before and just after irrigation?

(6 marks)

Question Four (15 marks)

(a) Discuss the efficiencies of different types of irrigation systems

(15 marks)

Question Five (15 marks)

(a) Describe the different types of soil moisture

(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)	85%
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)

SECTION A

Question One (25 marks)

- (a) With the aid of a diagram, outline the features of a centrifugal pump
(4 marks)
- (b) Giving examples, differentiate between surface and subsurface irrigation
(4 marks)
- (c) With respect to scale, state the different types of irrigation schemes
(4 marks)
- (d) State the different sources of water for irrigation, hence show the layout of a typical irrigation system
(6 marks)
- (e) Differentiate between surface and subsurface drainage **(3 marks)**
- (f) Describe the principle of operation of the following types of soil moisture sensors
- i. Tensiometer
 - ii. Neutron probe sensor
 - iii. Gypsum blocks
- (4 marks)**

SECTION B (45 marks)

Question Two (15 marks)

- (a) Discuss the different sources of irrigation water and their applicability, hence outline how a typical water intake system will be established
(7 marks)
- (b) Outline the main features of a sprinkler irrigation system
(8 marks)

Question Three (15 marks)

- (a) Define and briefly discuss the effects of salinity and sodicity on the irrigation, giving their remedial measures
(9 marks)
- (b) A soil sample is collected just before irrigation, and another soil sample is collected two days after irrigation. The soil sample collected before