(University of Choice)

MASINDE MULIRO UNIVERSITY OF SCIENCE AND TECHNOLOGY (MMUST)

MAIN CAMPUS

UNIVERSITY EXAMINATIONS

2021/2022 ACADEMIC YEAR

THIRD YEAR FIRST SEMESTER EXAMINATIONS

FOR THE DIPLOMA

IN

CIVIL ENGINEERING

COURSE CODE: DCE 081

COURSE TITLE: IRRIGATION AND DRAINAGE ENGINEERING

DATE: THURSDAY 21ST APRIL 2022 TIME: 8.00AM – 10.00AM

INSTRUCTIONS:

a) Answer Question **ONE** and any other **TWO** Questions
b) Marks for each question are indicated in the parenthesis.
c) Examination duration is **2 Hours**
d) Use of Mobile phones is NOT ALLOWED in the examination room.

MMUST observes ZERO tolerance to examination cheating

This Paper Consists of 3 Printed Pages. Please Turn Over.

QUESTION ONE – COMPULSORY (40 MARKS)

a) Define the following terms used in irrigation   [3 Marks]

    i.   Available water (AW)

    ii.   Field capacity (FC)

    iii. Evapotranspiration (ET)

b) By the aid of sketch briefly describe the field water cycle.   [4 Marks]

c) Explain FOUR factors to consider in designing of irrigation system   [4 Marks]

d) Briefly describe the following methods of irrigation giving two advantages of each method.

    i.   Spate irrigation

    ii.   Furrow irrigation

    iii. Border irrigation   [15 Marks]

e) Briefly describe the effect of poor drainage to the following

    i.   Soils

    ii.   Crops   [4 Marks]

f) A certain soil has a field capacity of 25% and a permanent wilting point of 10%. If the dry density of the soil is 1.5g/cc and the depth of the root zone is 0.75.

Determine

    i.   Storage capacity of the soil

    ii.   If the moisture content drops to 14% determine the depth of irrigation water to be applied to maintain available water. Take application efficiency as 80%.

                                                          [10 Marks]

QUESTION TWO (15 MARKS)

a)   Briefly describe how the following factors affect infiltration rates   [10 Marks]

    i.   In soil Tillage

    ii.   Soil compaction

    iii. Crop grown

    iv. Temperature

    v.   Water

a) State **five** benefits of drainage to an agricultural land under irrigation.   [5 Marks]

QUESTION THREE (15 MARKS) QUESTION

a) In furrow irrigation trials, the following data was availed

Distance from furrow head (m)	Advance time (minute)
0	0
10	1.5
20	3.5
30	6.0
40	10.0
50	19.0
60	30

From the data, draw a graph of furrow length verses advance time and estimate the length of the furrow, by use of a double ring infiltrometer which is $i = 2.5t^{2-0.5}$ and depth of infiltration (Di) is given as 50mm.   [10 Marks]

b) Discuss the causes of water logging   [5 Marks]

QUESTION FOUR (15 MARKS)

a) Briefly design criteria for basin irrigation system   [7 Marks]

b) Water is applied in an irrigated area every 10 days. The field application of water results in 0.025m/day discharge from deep percolation. The effective porosity is 0.05 and maximum permissible height of water table is 1m above the drains. The drain level is 1.8 below the soil surface and there is an impervious layer at 5.8m below the soil surface. Auger test gave the value of permeability K of 1m/day and the pipe drain of 10cm radius is used. Determine a range (e.g.45 to 50m) of the drainage spacing.   [8 Marks]