



ZIMBABWE

**MINISTRY OF HIGHER AND TERTIARY EDUCATION,
INNOVATION, SCIENCE AND TECHNOLOGY
DEVELOPMENT**

**HIGHER EDUCATION EXAMINATIONS COUNCIL
(HEXCO)**

NATIONAL DIPLOMA

IN

WATER RESOURCES AND IRRIGATION ENGINEERING

SUBJECT: Soil, Plant, Water Relations

PAPER NO: 579/15/S05

DURATION: 3 Hours

MARCH/APRIL 2023 EXAMINATION

REQUIREMENTS

Calculator, ruler, pencil

INSTRUCTIONS TO CANDIDATE

- 1. Answer ANY FOUR questions.**
- 2. All questions carry equal marks.**

This paper consists of 3 printed pages.

QUESTION 1

- (a) Explore any three methods used to determine soil texture. (10 marks)
- (b) Describe the soil textural categories of primary soil particles using the textural triangle. (10 marks)

QUESTION 2

- (a) Enumerate in detail soil physical characteristics. (15 marks)
- (b) Explain soil mineral composition. (5 marks)

QUESTION 3

- (a) Explore cation Exchange Capacity and enumerate factors affecting C.E.C. (10 marks)
- (b) Describe the following terms and effects on plant growth
 - (i) Salinity (3 marks)
 - (ii) Sodicity (3 marks)
 - (iii) Base saturation (4 marks)

QUESTION 4

Explain the following in relation to irrigation practice.

- (a) permanent wilting point (4 marks)
- (b) field capacity (4 marks)
- (c) available soil moisture (4 marks)
- (d) management allowable depletion (4 marks)
- (e) soil water types (4 marks)

QUESTION 5

- (a) Describe the term “Evapotranspiration”. (5 marks)
- (b) Elaborate the factors influencing “Evapotranspiration”. (10 marks)
- (c) Relate Etc to crop growth stages. (5 marks)

QUESTION 6

- (a) Explain the meaning of the following terms.
- (i) Effective precipitation. (3 marks)
 - (ii) Irrigation water requirements (3 marks)
 - (iii) irrigation water requirements (3 marks)
- (b) Calculate the irrigation water need (IN) of paddy rice for the month of April when given:
- $E_{To} = 6\text{mm /day}$
 - $K_c = 1,1$
 - The root zone has already been saturated in the previous month.
 - $PERC = 5\text{mm /day}$
 - The water layer (100mm) needs to be established during April
 - $P_e = 135\text{mm/month}$ (6 marks)
- (c) Compare and contrast the Blaney – Criddle method and the Penman Montelth method. (5 marks)

...../cn