



**UNIVERSITY OF ESWATINI
FINAL EXAMINATION PAPER**

PROGRAMME: BSC ABE 3, BSC AGRON 3, AND BSC HORT 3

COURSE CODE: ABE303

TITLE OF PAPER: IRRIGATION PRINCIPLES

TIME ALLOWED: TWO (2) HOURS

SPECIAL MATERIAL REQUIRED: NONE

INSTRUCTIONS: ANSWER QUESTION ONE AND ANY TWO OTHER QUESTIONS.

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SECTION I COMPULSORY

QUESTION 1

a) A soil analysis was carried out in a field, and the results were as follows:

- Soil moisture content at saturation on volume basis – 56 %
- Soil moisture content at field capacity on mass basis – 46 %
- Soil moisture content at permanent wilting point on mass basis – 18 %
- Particle density – 2.65 g/cm³

i) Determine the available water (in mm) for a crop with rooting depth of 60 cm. **[12 marks]**

ii) Explain why it is not recommended to use the available water (as obtained in i above) as the net irrigation. **[3 marks]**

b) Discuss five (5) benefits of irrigation, giving examples where applicable. **[20 marks]**

c) Explain what a soil moisture characteristic curve is, and its application in irrigation management. **[5 marks]**

TOTAL MARKS = 40

SECTION II ANSWER ANY TWO QUESTIONS

QUESTION 2

a) Explain how in the field and/or laboratory the various levels of soil moisture (saturation, field capacity and permanent wilting point) can be determined. **[15 marks]**

b) Draw a well labelled diagram/graph, showing how the soil’s infiltrability changes with time from onset of an irrigation or rainfall event. On your graph, show the patterns of a clayey and a sandy soil. **[6 marks]**

- c) Explain how the following factors affect the soil's infiltrability:
- i) Soil texture [3 marks]
 - ii) Soil surface conditions [3 marks]
 - iii) Soil structure [3 marks]

TOTAL MARKS = 30

QUESTION 3

- a) Write notes on the different types of sprinkler irrigation. [20 marks]
- b) Describe the process of soil salinization, i.e. what it is, how it affects crop growth and the measures that can be taken to prevent it from occurring. [10 marks]

TOTAL MARKS = 30

QUESTION 4

- a) Provide a clear description of how one can determine the seasonal crop water requirement, and irrigation requirement for a proposed crop to be grown at the Dalcrue Farm. [15 marks]
- b) One approach used for irrigation scheduling is the soil water balance method. Describe this method, explaining the various components of the soil water balance. [15 marks]

TOTAL MARKS = 30