



UNIVERSITY OF SWAZILAND
RESIT/SUPPLEMENTARY EXAMINATION PAPER

PROGRAMME: BSC ABE III
BSC AGRONOMY III
BSC HORTICULTURE III

COURSE CODE: ABE303/ ABE 302

TITLE OF PAPER: IRRIGATION PRINCIPLES/PRINCIPLES OF IRRIGATION

TIME ALLOWED: TWO (2) HOURS

SPECIAL REQUIREMENT: A4 DRAWING PAPER

INSTRUCTIONS: ANSWER QUESTION ONE AND ANY TWO OTHER QUESTIONS.

DO NOT OPEN THIS PAPER UNTIL PERMISSION HAS BEEN GRANTED BY THE CHIEF INVIGILATOR

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SECTION I: COMPULSORY QUESTION**QUESTION 1**

a) A tomato crop is to be irrigated by a system with 90% efficiency in Malkerns. A tomato crop can have a rooting system that can go as deep as 125 cm if the profile allows. An analysis of the soil profile of the field shows the following details:

Soil horizon	Depth (cm)	Soil material	Field capacity (%) by weight	PWP (%) by weight	Bulk density (kg/m ³)
A	0-74	Sandy clay loam	25	12	1350
B	74-120	Sandy clay loam	30	15	1230
C	120-200	Impervious hard pan	25	20	2160
D	200+	Consolidated bedrock	10	12	3340

Determine the gross irrigation requirement and the irrigation interval during the month of October when mean average evaporation is 6.9 mm/day and the p-factor is 0.45.

[20 marks]

b) Discuss with examples the following methods used in real time scheduling:

- Plant indicators
- Soil water content determination
- Soil water potential determination
- Water balance method

[20 marks]

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SECTION II: ANSWER TWO QUESTIONS FROM THIS SECTION**QUESTION 2**

Discuss in detail the importance of uniformity in irrigation, and how it can be measured in the field, including the formulae used in the relevant calculations. Your discussion should also include the causes of reduced uniformities and how these can affect irrigation water management and crop productivity.

[30 marks]**QUESTION 3**

Discuss the following concepts as used in the physics of soil and water:

- a) soil water equilibriums
- b) Soil water potentials
- c) Particle density
- d) Bulk density
- e) Porosity

[30 marks]**QUESTION 4**

Irrigation is about the replenishment of water in the root zone. For that to be achieved, the water has to infiltrate into the soil. Infiltration is affected by a number of factors. Discuss five of these factors.

[30 marks]