UNIVERSITY OF SWAZILAND
SUPPLEMENTARY EXAMINATION PAPER

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

COURSE CODE: ABE 302

TITLE OF PAPER: PRINCIPLES OF IRRIGATION

TIME ALLOWED: TWO (2) HOURS

SPECIAL MATERIAL REQUIRED: NONE

INSTRUCTIONS: ANSWER QUESTION ONE AND ANY OTHER TWO QUESTIONS

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QUESTION 1

In a water management experiment, soil samples were extracted from a 0-25 cm soil profile. The following were calculated.

Bulk density	1.2 g/cm^3
Water content at present by mass	0.18
Saturation water content by volume	0.55
Field capacity by volume	0.45
Particle density	2.65g/cm^3
Permanent wilting point by volume	0.06

a) If water is used at an average rate of 4 mm/day, how long will it take for the 0-25 cm layer of soil to be at permanent wilting point from the present moisture content?
[10 marks]

b) A rainstorm of 30 mm infiltrates into the soil when it is at a water content of 0.25 on volume basis. To what depth would the water have penetrated if measured

i) immediately after the storm **[5 marks]**
ii) 24 hours after the storm **[5 marks]**

c) Explain

i) Why a double ring infiltrometer is used instead of a single ring when carrying out an infiltration exercise. **[10 marks]**
ii) Why the gravimetric method of measuring soil moisture content may be less accurate when compared to tensiometer or moisture meter.
[10 marks]

Total = 40 marks

QUESTION 2

Discuss with examples the following methods used in real time scheduling of irrigation:

i. Plant indicators **[8 marks]**
ii. Soil water content **[8 marks]**
iii. Soil water potential **[7 marks]**
iv. Water balance method **[7 marks]**

Total = 30 marks

QUESTION 3

a) Describe the concept of salinity in soils, outlining the following:

i) How it is caused **[5 marks]**
ii) How it affects yields **[5 marks]**
iii) How it can be prevented or corrected **[5 marks]**

b) Explain how the quality and quantity of water can influence the choice of an irrigation system. **[10 marks]**

c) Briefly describe the relationship between irrigation system uniformity and efficiency. **[5 marks]**

Total = 30 marks

QUESTION 4

Briefly discuss the following with respect to irrigation water use:

i) Steady-state infiltration rate **[5 marks]**
ii) Over-irrigation **[5 marks]**
iii) Soil water characteristic curve **[5 marks]**
iv) Sub-surface drip irrigation **[5 marks]**
v) Head losses **[5 marks]**
vi) Pumping head **[5 marks]**

Total = 30 marks