UNIVERSITY OF SWAZILAND
MAIN EXAMINATION PAPER

PROGRAMME: DIPLOMA IN AGRIC. ED. 3 AND DIPLOMA IN AGRICULTURE 3

COURSE CODE: LUM 303 (OLD PROGRAMME)

TITLE OF PAPER: IRRIGATION

TIME ALLOWED: TWO (2) HOURS

SPECIAL MATERIAL REQUIRED: NONE

INSTRUCTIONS: ANSWER QUESTION ONE AND ANY TWO OTHER QUESTIONS

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

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
ii)   24 hours after the storm

[10 marks]

c) Explain

i)   Why a double ring infiltrometer is used instead of a single ring when carrying out an infiltration exercise.
ii)   Why the gravimetric method of measuring soil moisture content may be less accurate when compared to others.

[20 marks]

QUESTION 2

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

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

[30 marks]

QUESTION 3

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

- How it is caused
- How it affects yields
- How it can be prevented or corrected   **[15 marks]**

b) Define sodicity, and explain why it is an issue in irrigation management and how it can be corrected.

         [15 marks]

QUESTION 4

Write short notes on the following:

- i) Hydraulic conductivity
- ii) Over-irrigation
- iii) Soil water characteristic curve
- iv) Pipe size optimisation
- v) Head losses
- vi) Pumping head

         [30 marks]