



**UNIVERSITY OF SWAZILAND
FINAL EXAMINATION PAPER**

PROGRAMME: DIP AGRIC III & DIP AGRIC ED. III

COURSE CODE: LUM 303

TITLE OF PAPER: IRRIGATION

TIME ALLOWED: TWO (2) HOURS

SPECIAL MATERIAL REQUIRED: NONE

**INSTRUCTIONS: ANSWER QUESTION ONE AND ANY TWO
OTHER QUESTIONS.**

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GRANTED BY THE CHIEF INVIGILATOR**

SECTION I: COMPULSORY QUESTION**QUESTION 1**

Soil profile analysis in an irrigation field at a time before irrigation produced the following data:

Soil depth (cm)	Bulk density (g/cm^3)	Particle density (g/cm^3)	Field capacity water content (g/g)	Permanent wilting point water content (g/g)	Measured water content (g/g)
0-15	1.25	2.65	0.24	0.13	0.16
15-30	1.30	2.68	0.28	0.14	0.18
30-60	1.35	2.66	0.31	0.15	0.23
60-90	1.40	2.67	0.33	0.15	0.26
90-120	1.40	2.67	0.31	0.14	0.28
120-200	1.41	2.67	0.30	0.13	0.29

Assuming the root zone is 90 cm, calculate:

- the total available water (in mm) in the root zone (15 marks)
- the soil moisture deficit (in mm) in the root zone (10 marks)
- the volume of water (in m^3) needed to irrigate an area of 1.5 ha, assuming that irrigation is due at the time of analysis and that it is required to replenish the soil moisture to field capacity (8 marks).
- If irrigation is to be scheduled every time soil water content reaches the level found at the time of this analysis, what manageable allowable depletion (in %) would this represent (7 marks)?

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

An undisturbed soil sample is taken from an irrigated field with soil particle density of 2.65 g/cm^3 . The sampling ring has the following characteristics:

external diameter	52 mm
thickness	2 mm
height	50 mm
weight	80 grams

The gross weight of the wet sample is 200 grams. The sample is then placed in an oven and dried for 24 hours at 105°C . The resulting gross weight is 160 grams.

Calculate:

- mass water content (10 marks)
- soil bulk density (8 marks)
- volume water content (7 marks)
- total porosity (5 marks)

QUESTION 3

Briefly but concisely, describe the meaning of the following terms in irrigation

- a) non-effective rainfall in irrigation; (6 marks)
- b) irrigation interval (6 marks)
- c) total irrigation; (6 marks)
- d) moisture holding capacity of a soil; (6 marks)
- e) management allowable depletion of soil water (6 marks)

(QUESTION 4

Discuss the important soil factors that must be considered when assessing the suitability of land for irrigation. (30 marks)