



**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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**SECTION I: COMPULSORY QUESTION**

**QUESTION 1**

- (a) Describe how you would determine field capacity moisture content of an irrigated soil. (10 marks)
- (b) Soil profile analysis in an irrigation field at a time before irrigation produced the following data:

Soil depth (cm)	Bulk density (g/cm <sup>3</sup> )	Particle density (g/cm <sup>3</sup> )	Field capacity water content (g/g)	Permanent wilting point water content (g/g)	Measured water content (g/g)
0-20	1.21	2.65	0.30	0.10	0.16
20-40	1.23	2.68	0.35	0.11	0.18
40-60	1.20	2.66	0.31	0.12	0.23
60-90	1.18	2.67	0.33	0.12	0.26
90-120	1.24	2.67	0.31	0.11	0.28
120-200	1.26	2.67	0.30	0.10	0.29

Assuming the root zone is 80 cm, calculate:

- (a) the total available water (in mm) in the root zone (10 marks)
- (b) the soil moisture deficit (in mm) in the root zone (5 marks)
- (c) the volume of water (in m<sup>3</sup>) 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 (10 marks)
- (d) 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? (5 marks)

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

**QUESTION 2**

With the aid a clearly labelled diagram, describe the basic principles of a tensiometer as a tool for scheduling irrigation. (30 marks)

**QUESTION 3**

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

- a) steady state infiltration rate in a soil; (6 marks)
- b) readily available water in a soil; (6 marks)
- c) total irrigation; (6 marks)
- d) crop water demand; (6 marks)
- e) uniformity of water distribution in a sprinkler irrigated field. (6 marks)

**(QUESTION 4**

Describe the procedure for measuring infiltration in a soil using a double ring infiltrometer. (30 marks)