



**UNIVERSITY OF SWAZILAND  
MAIN EXAMINATION PAPER**

**PROGRAMME: BSC IN LAND AND WATER MANAGEMENT  
YEAR 4**

**COURSE CODE: LUM 403 (NEW PROGRAMME)**

**TITLE OF PAPER: IRRIGATION WATER MANAGEMENT**

**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**

**QUESTION 1**

From Table 1, and the information given below, calculate the value of irrigation water ( $E/m^3$ ) for sugarcane production.

Table 1: Effective rainfall and evapotranspiration at Malkerns

Month	days	ET <sub>c</sub> (mm)	Effective rainfall (mm)
January	31	205	90
February	28	189	81
March	31	171	58
April	30	131	39
May	31	109	17
June	30	86	9
July	31	96	7
August	31	115	10
September	30	121	23
October	31	122	48
November	30	62	65
December	31	126	78

Given:

- sugarcane is to be irrigated in order not to experience any water stress
- the overall irrigation efficiency is 65%
- The selling price of sugar is E2000/ton
- The irrigated cane yield is approximately 120 tons/ha, of which 13% is sugar
- If rainfed, the yield would be 4.3 tonnes of sugar/ha (note that the weight given is of sugar not cane)

**[40 marks]**

**QUESTION 2**

With the aid of appropriate diagram(s), explain how a soil can be calibrated in order for one to be able to relate a tensiometer reading to the soil moisture content.

**[30 marks]**

**QUESTION 3**

With more water being required for irrigation in the country amidst the prevailing scarcity, the use of wastewater for irrigation seems a reasonable option. Discuss the opportunities and the hazards involved in the use of wastewater.

[30 marks]

**QUESTION 4**

a) Soil salinity is a major problem especially in semi-arid and arid regions. Define the following factors considered in salinity.

- sodium adsorptive ratio (SAR)
- exchangeable sodium percentage (ESP)
- extract electrical conductivity ( $EC_e$ )

[15 marks]

b) A maize crop is irrigated by furrow irrigation. The crop is planted in a uniform loam soil and river water, which has an  $EC_w$  of 1.2 dS/m, is used for irrigation. The crop evapotranspiration is 800 mm/season. The irrigation application efficiency is 0.65. Given that for a 100 percent yield potential for maize, the  $EC_e$  should be 1.7 dS/m, how much additional water must be applied for leaching, assuming the inefficiency is due to deep percolation.

[15 marks]