



**UNIVERSITY OF SWAZILAND
MAIN EXAMINATION PAPER**

PROGRAMME: BSC IN AGRICULTURE (LWM OPTION) YEAR 5

COURSE CODE: LUM 402 (OLD PROGRAMME)

TITLE OF PAPER: IRRIGATION 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

An irrigation project was being planned for in Big-bend, in the Lowveld of Swaziland. Cotton was to be grown in the summer months in a 10 hectare field (250m x 400m). The water supply is an open source at one corner, with a maximum vertical lift of 2m. The cotton is intended to be scheduled to avoid it coming under water stress. The peak design water requirements have already been determined from CROPWAT as 10 mm/day net, with a maximum allowable soil moisture deficit of 100 mm. An efficiency of 80% has been suggested for design purposes.

a) Calculate the net and gross applications at each irrigation, and the corresponding intervals between irrigations.

[10 marks]

b) If the application rate is set at 10.17 mm/hr, determine the set time, and the maximum number of moves per day if operation can carry out for the whole day (i.e. 24 hours).

[10 marks]

c) Given that a pump is being used to bring the water to the field and the pump duty is 33.6 m head of water at 23.6 l/s with a pump efficiency of 0.6. Calculate the power required in kilowatts.

[10 marks]

d) If the pump were to deliver water for 6 out of 7 days, for a cropping season of 180 days. Calculate the pumping costs for the whole season of the cotton crop, given that the Swaziland Electricity Board charges E0.42 per kw-hr.

[10 marks]

QUESTION 2

Irrigation scheduling is important in the efficient and effective use of water. When there is proper scheduling, over and under-irrigation will be avoided. Discuss how these two scenarios mentioned above (i.e. over-irrigation and under-irrigation) come about and their implications on productivity, profitability and the environment.

[30 marks]

QUESTION 3

In general, efficiency is defined as the ratio of output to the input.

- a) Describe the following efficiencies in the context of irrigation management.
- i) Conveyance efficiency
 - ii) Application efficiency **[10 marks]**
- b) It is very likely to achieve an overall irrigation efficiency of more than 90% with drip irrigation. What specific advantages does this method of irrigation have to achieve such a high efficiency? **[10 marks]**
- c) Some experts in water have questioned the concept of efficiency, arguing that if our understanding of efficiency were not to be limited to field level but rather a catchment level, we would understand that even with these 'low efficient' methods of irrigation, the water is not really lost but transferred to other users. Comment. **[10 marks]**

QUESTION 4

Irrigation development in Swaziland has been identified as one of the solutions to the seemingly 'chronic' poverty the country is suffering from. While this may be true, its adverse impacts on the environment cannot be ignored. Give a detailed description on how irrigation impacts on the environment, and how such impacts can at least be lessened.

[30 marks]