UNIVERSITY OF SWAZILAND
FINAL EXAMINATION PAPER

PROGRAMME; BSc. LAND AND WATER MANAGEMENT IV

COURSE CODE: LUM 403

TITLE OF PAPER: IRRIGATION WATER MANAGEMENT

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

LUM 403: IRRIGATION WATER MANAGEMENT

MAIN EXAMINATION MAY 2011

Answer question 1 and any other two questions

QUESTION 1

(a) Define the following terms

i. Irrigation efficiency (5 marks)

ii. Water use efficiency (5 marks)

(b) Flow measurements along a canal system supplying water for irrigation in Luyengo and Ntondozi areas were made as part of evaluating the conveyance efficiency of the canal. The canal has been constructed through different soil materials. In Luyengo area the entire canal is unlined while along Ntondozi area, the canal has lined as well as unlined sections. The details of the canal and the flow measurements are given in Table 1.

Table 1: Canal system for conveying water in Luyengo and Ntondozi areas

Canal section	Soil type	Measured discharge	Average steady state loss		Length of canal used	
		(l/s)	Lined (l/s/100 m)	Unlined (l/s/100 m)	Lined (m)	Unlined (m)
Luyengo area						
Block 1	Silty clay	33.5	-	5.4	-	402.8
Block 2	Silty clay	59.3	-	6.2	-	413.0
Block 3	Silty loam	51.4	-	5.2	-	502.6
Block 4	Silty clay	47.7	-	5.9	-	400.5
Block 5	Silty loam	52.2	-	6.2	-	531.5
Ntondozi area						
Block 1	Sandy loam	88.0	2.6	6.8	149.6	190.5
Block 2	Sandy loam	88.5	2.6	5.0	278.0	81.2
Block 3	Sandy loam	86.8	2.8	7.7	152.2	81.4
Block 4	Loam	75.6	1.9	10.0	363.3	127.0
Block 5	Loam	94.0	5.4	5.8	269.0	111.0
Block 6	Loam	88.3	4.5	11.3	112.8	136.3

Determine the:

a) Conveyance losses (in l/s) each block (15 Marks);

b) Conveyance efficiency of the entire irrigation canal (%); (10 Marks).

c) How the conveyance efficiency can be improved. (5 Marks)

QUESTION 2

The amount of water a crop consumes (ET_c) can be estimated by considering the balance of water entering and leaving the soil profile in which the crop grows. This is commonly known as

the *water balance method.* With the aid of a clearly labelled diagram, describe this method and discuss its limitations in using it to estimate crop water consumption (30 marks).

QUESTION 3

Discuss the

a) Causes of salinity in irrigated fields; (10 Marks)

b) Consequences of salinity problem; (10 Marks) and

c) Measures you would take to reduce the salinity problem. (10 Marks)

QUESTION 4

Irrigated agriculture involves abstracting water from a source, and conveying it, delivered it on a farm and applying it on the field. However, in the course of performing these processes there are invariably negative environmental impacts which must be minimised when designing, operating and managing the system. Briefly and concisely, discuss

a) Five major infield negative environmental impacts of irrigation systems; (10 Marks);

b) Four external negative impacts of irrigation systems; (8 Marks) and

c) Mitigation measures to reduce these impacts. (12 Marks)