



“Investing in Africa’s future”

COLLEGE OF HEALTH, AGRICULTURE & NATURAL SCIENCES

NAAE 506: IRRIGATION AGRONOMY

END OF FIRST SEMESTER FINAL EXAMINATIONS

NOVEMBER/DECEMBER 2022

LECTURER: DR. O. SVUBURE

DURATION: 3 HOURS

INSTRUCTIONS TO CANDIDATES

1. Answer **ALL** questions in Section A and any **THREE** (3) in Section B
2. Section A carries 40 marks and **Each** question in Section B carries 20 marks
3. Show all calculations on the answer sheet
4. Part marks are indicated in square brackets
5. This paper consists of six (6) questions

REQUIREMENTS

Non-Programmable Scientific Calculator

SECTION A: Answer all the questions in this section [40 marks]

QUESTION 1

Table Q1 contains daily Class A pan evaporation records for the month of November and December 1998 recorded at Chinhoyi University of Technology (CUT) Farm located in NW Zimbabwe. An average K_p value of 0.75 was assumed. Using the recorded data, perform the following tasks:

- (i) Copy and complete the table [32]
- (ii) Compute the pan evaporation, E_p in *mm/month*. [2]
- (iii) Compute the average E_p in *mm/day*. [2]
- (iv) Estimate the potential evapotranspiration, E_{To} in *mm/month*. [2]
- (v) Estimate the E_{To} in *mm/day*. [2]

Table Q1: Daily Class A pan evaporation data for the months of November and December 1998 recorded at Chinhoyi University of Technology (CUT) Farm located in NW Zimbabwe.

Day	Pan Water depth (mm)	Rainfall (mm)	Epan (mm)	ETo (mm)
1	66			
2	62			
3	57			
4	54			
5	50/70			
6	65			
7	62	6		
8	58			
9	53/75			
10	69			
11	66	5		
12	60			
13	55			
14	51			
15	45/80			
16	73			
17	66			
18	60			
19	55	2		
20	50			
21	46			
22	40/85			
23	80	3		
24	76			
25	71			
26	68			
27	66			
28	65/85			
29	80			
30	73	4		
1	69			

SECTION B: Answer any three questions in this section [60 marks]

QUESTION 2

- (a) State two (2) principle forces that hold water in soils. [2]
- (b) Describe any three (3) agronomic practices to improve soil moisture storage capacity. [9]
- (c) Explain any three (3) indicators used in assessing irrigation water quality. [9]

QUESTION 3

- (a)
 - (i) Justify the need for irrigated agriculture. [6]
 - (ii) Describe any three (3) important natural conditions that have an impact on the choice of an irrigation method by the farmer. [9]
- (b) Explain the potential of irrigated agriculture in Zimbabwe. [5]

QUESTION 4

- (a) Define crop Water Use Efficiency (WUE). [2]
- (a) Describe any:
 - (i) three (3) strategies to enhance WUE by increasing the crop yield without increasing water consumption, and any [9]
 - (ii) three (3) strategies of restricting crop water consumption without compromising yield. [9]

QUESTION 5

- (a) Describe the process of water infiltration into a dry soil. [4]
- (b) Explain any two (2) factors that affect the infiltration rate of a soil profile. [6]
- (c) A double ring infiltrometer is used to estimate Horton type infiltration rates for a proposed irrigation site. The initial and final infiltration rates are 20 and 4 cm/h, respectively. The recession constant is 1.5 h^{-1} .
 - (i) Calculate the infiltration rate after 30 minutes. [3]
 - (ii) Calculate the amount of water infiltrated in m^3 for 1 ha area after 2 hours. [3]

(d) Describe the Rainfall Simulator method for measuring field infiltration rates of soils. [4]

QUESTION 6

(a) Explain any four factors to consider in crop selection for irrigated production. [12]

(b) Describe the major agronomic practices in irrigated *Triticum aestivum* L. production. 8]

END OF EXAMINATION PAPER