



KIBABII UNIVERSITY

UNIVERSITY EXAMINATIONS
2017/2018 ACADEMIC YEAR

THIRD YEAR SECOND SEMESTER
SPECIAL/SUPPLIMENTARY EXAMINATIONS

FOR THE DEGREE OF B.SC (AGRIC & BIOTECH)

COURSE CODE: SAB 313

COURSE TITLE: IRRIGATION AND DRAINAGE

DATE: 16TH OCTOBER 2018

TIME: 11:30 – 1:30 PM

INSTRUCTIONS TO CANDIDATES

- Answer **QUESTION ONE** (Compulsory) and any other two (2) Questions.
- Indicate **answered questions** on the front cover.
- Start every question on a new page and make sure question's number is written on each page.

This paper consists of 3 printed pages. Please Turn Over



KIBU observes ZERO tolerance to examination cheating

QUESTION ONE - Compulsory (30 Marks)

- a) What are the three criteria used in the selection of sprinklers for overhead irrigation? **(3 Marks)**
- b) Briefly explain four advantages of using a portable irrigation system **(4 Marks)**
- c) State any three water conveyance structures used in surface irrigation **(3 Marks)**
- d) Draw a sketch of a centrifugal pump and label it **(6 Marks)**
- e) Define the following terms with regard to pumps:
- (i) Cavitation **(2 Marks)**
 - (ii) Priming **(2 Marks)**
 - (iii) Characteristic curves **(3 Marks)**
- f) What three factors would you consider while selecting the depth of a drain pipe? **(3 Marks)**
- g) Explain any four assumptions made in the Hooghoudt equation for drain spacing under Steady-state conditions **(4 Marks)**

QUESTION TWO (20 Marks)

- a) Define specific speed of a centrifugal pump **(2 Marks)**
- b) Compute the specific speed of a centrifugal pump that runs at a speed of 200 rpm at its best efficiency point and delivers 50 litres of water per second at a total head of 30 metres **(6 Marks)**
- c) State three causes of the following pump troubles:
- (i) Pump does not start **(3 Marks)**
 - (ii) Pump is noisy and vibrates **(3 Marks)**
 - (iii) Pump discharges very little water **(3 Marks)**
 - (iv) Pump uses too much power **(3 Marks)**

QUESTION THREE (20 MARKS)

- a) State four factors that affect infiltration of irrigation water into the soil **(6 Marks)**
- b) The following data was obtained from a Ring Infiltrometer Test of a clay-loam soil.

Time, t (minutes)	Cumulative Infiltration depth, I (cm)
1	0.52
15	3.15
30	4.80
60	7.20
150	14.05
200	15.30

Use Kostiakov's Infiltration Equation to determine the following:

- (i) The constants in the equation **(8 Marks)**
- (ii) Cumulative infiltration after 3 hours **(3 Marks)**
- (iii) Instantaneous infiltration of the soil after 5 hours **(3 Marks)**

QUESTION FOUR (20 Marks)

- a) Explain three factors that affect the uniformity of irrigation when sprinklers are used in Overhead irrigation **(6 Marks)**
- b) Identify and explain four advantages and one disadvantage of using a Portable Sprinkler irrigation system **(5 Marks)**
- c) State four conditions for the use of a Permanent (solid-set) Sprinkler irrigation system **(4 Marks)**
- d) Use a diagram to explain how a Centre-Pivot Sprinkling machine works **(5 Marks)**

QUESTION FIVE (20 Marks)

- a) State four reasons for draining a horticultural farm **(8 Marks)**
- b) Use diagrams to explain four different layout patterns of a drainage system **(12 Marks)**