KIBABII UNIVERSITY

UNIVERSITY EXAMINATIONS
2017/2018 ACADEMIC YEAR

FOURTH YEAR SECOND SEMESTER
MAIN EXAMINATIONS

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

COURSE CODE: SAB 415

COURSE TITLE: SOIL AND WATER CONSERVATION

DATE: 6TH AUGUST 2018 **TIME: 9 – 11 AM**

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

QUESTION ONE (COMPULSORY) – (30 MARKS)

a) Briefly discuss the concept of soil and water conservation **(2 Marks)**

b) State five objectives of soil conservation **(2 Marks)**

c) Explain the problems encountered while implementing soil and water conservation activities **(2 Marks)**

d) Explain reasons why soil conservation must be undertaken **(3 Marks)**

e) Describe the role of three main agents of water erosion **(3 Marks)**

f) Define each parameter in Universal Soil Loss Equation (USLE) **(5 Marks)**

g) Applying the principles of survey in the design of soil and water conservation structures:

i) Explain with help of a sketch how the slope, VI and HI are determined **(3 Marks)**

ii) With a sketch explain parts of a dumpy level **(3 Marks)**

h) Outline the function of biological measures in soil and water conservation **(2 Marks)**

i) Explain why traditional knowledge is important in soil and water conservation **(2 Marks)**

j) Discuss soil and water conservation key areas in the AGRICULTURE, FOOD AND FISHERIES AUTHORITY ACT, 2013. **(3 Marks)**

QUESTION TWO (20 MARKS)

a) Describe the procedure of applying Universal Soil Loss Equation **(3 Marks)**

b) Define soil loss tolerance **(3Marks)**

c) Calculate annual soil loss in Bungoma County, Kibabii University given the following information: i) soil content is greater than 2% organic matter content (OMC) 10% sand, 30% clay, and 60% silt; ii) slope length is 122m and slope is 6%; iii) crop grown is tomatoes; iv) soil conservation measure is strip cropping across the contour; v) Rainfall erosivity factor (R) is for Lake Victoria basin of 900. Use the figure for soil texture and the tables attached **(14 Marks)**

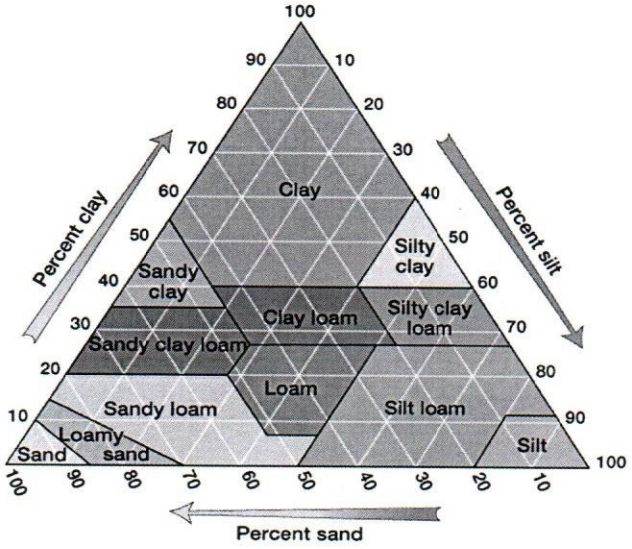

Table 2. K Factor Data

Textural Class	K Factor tonnes/hectare (tons/acre)		
	Average OMC*	**Less than 2% OMC**	**More than 2% OMC**
Clay	0.49 (0.22)	0.54 (0.24)	0.47 (0.21)
Clay loam	0.67 (0.30)	0.74 (0.33)	0.63 (0.28)
Coarse sandy loam	0.16 (0.07)	–	0.16 (0.07)
Fine sand	0.18 (0.08)	0.20 (0.09)	0.13 (0.06)
Fine sandy loam	0.40 (0.18)	0.49 (0.22)	0.38 (0.17)
Heavy clay	0.38 (0.17)	0.43 (0.19)	0.34 (0.15)
Loam	0.67 (0.30)	0.76 (0.34)	0.58 (0.26)
Loamy fine sand	0.25 (0.11)	0.34 (0.15)	0.20 (0.09)
Loamy sand	0.09 (0.04)	0.11 (0.05)	0.09 (0.04)
Loamy very fine sand	0.87 (0.39)	0.99 (0.44)	0.56 (0.25)
Sand	0.04 (0.02)	0.07 (0.03)	0.02 (0.01)
Sandy clay loam	0.45 (0.20)	–	0.45 (0.20)
Sandy loam	0.29 (0.13)	0.31 (0.14)	0.27 (0.12)
Silt loam	0.85 (0.38)	0.92 (0.41)	0.83 (0.37)
Silty clay	0.58 (0.26)	0.61 (0.27)	0.58 (0.26)
Silty clay loam	0.72 (0.32)	0.79 (0.35)	0.67 (0.30)
Very fine sand	0.96 (0.43)	1.03 (0.46)	0.83 (0.37)
Very fine sandy loam	0.79 (0.35)	0.92 (0.41)	0.74 (0.33)

Table 3A. LS Factor Calculation

Slope Length: m (ft)	Slope (%)	LS Factor
30.5 (100)	10	1.38
	8	1.00
	6	0.67
	5	0.54
	4	0.40
	3	0.30
	2	0.20
	1	0.13
	0	0.07
61 (200)	10	1.95
	8	1.41
	6	0.95
	5	0.76
	4	0.53
	3	0.39
	2	0.25
	1	0.16
	0	0.08
122 (400)	10	2.76
	8	1.99
	6	1.35
	5	1.07
	4	0.70
	3	0.52
	2	0.30
	1	0.20
	0	0.09
244 (800)	10	3.90
	8	2.82
	6	1.91
	5	1.52
	4	0.92
	3	0.68
	2	0.37
	1	0.24
	0	0.11
488 (1,600)	10	5.52
	8	3.99
	6	2.70
	5	2.15

Table 4A. Crop Type C- Factor

Crop Type	Factor
Grain corn	0.40
Silage corn, beans & canola	0.50
Cereals (spring & winter)	0.35
Seasonal horticultural crops	0.50
Fruit trees	0.10

Table 5. P Factor Data

Support Practice	P Factor
Up & down slope	1.0
Cross slope	0.75
Contour farming	0.50
Strip cropping, cross slope	0.37
Strip cropping, contour	0.25

QUESTION THREE (20 MARKS)

a) While determining elevation of a catchment using a dumpy level so as to design the appropriate soil and water conservation measures, the following readings were taken: From a dumpy level position X_1, the following readings taken on BM, A, B, C are 0.8, 1.2, 2.1 and 2.8. the dumpy level is shifted and readings taken on C, D, E and F are 1.3, 1.6, 2.6 and 3.8. Book the readings and calculate RLs of points A, B,C,D, E and F.RL of the BM is 500m **(12 Marks)**

b) What type of measures do you recommend for effective soil and water conservation in (a) above? **(8 Marks)**

QUESTION FOUR (20 MARKS)

a) Briefly discuss agronomic measures used in soil and water conservation **(10 Marks)**

b) Discuss the characteristics of surface run-off in determining the amounts of runoff for design of SWC structures **(6 Marks)**

c) What are the catchment factors that affect run-off? **(4 marks)**

QUESTION FIVE (20 MARKS)

a) Explain the factors that lead to watershed deterioration **(8 Marks)**

b) Discuss the consequences of water shed deterioration **(6 Marks)**

c) In watershed management, watershed operation is influenced by natural factors, briefly discuss these factors **(6 Marks**