NATIONAL UNIVERSITY OF LESOTHO

FACULTY OF AGRICULTURE

DEPARTMENT OF SOIL SCIENCE AND RESOURCE CONSERVATION

SSR 315: SOIL GENESIS, MORPHOLOGY AND CLASSIFICATION

PROGRAMME: BSC AGRICULTURE (SOIL SCIENCE)

YEAR 3

DECEMBER 2017	**100 MARKS**	**3 HOURS**

INSTRUCTIONS

1. Answer any three (3) questions from Section A

2. Section B is compulsory

Question 1 [25 marks]

a) Describe how climate influences the process of soil formation. **[10 marks]**

b) Distinguish between eluviation and illuviation processes. **[5 marks]**

c) Briefly discuss the sequence of soil formation from parent material to the formation of the solum. **[10 marks]**

Question 2 [25 marks]

a) Compare and contrast these two horizons: AB-Horizon and A/B-Horizon.
[8 marks]

b) Discuss any three (3) soil colours and clearly indicate what they suggest about other soil. **[9 marks]**

c) Discuss the importance of soil texture particularly in predicting agricultural productivity. **[8 marks]**

Question 3 [25 marks]

a) Discuss the variation in soils at the following landscape positions: summit, shoulder and toeslope based on the following depth, fertility and erosion. **[15 marks]**

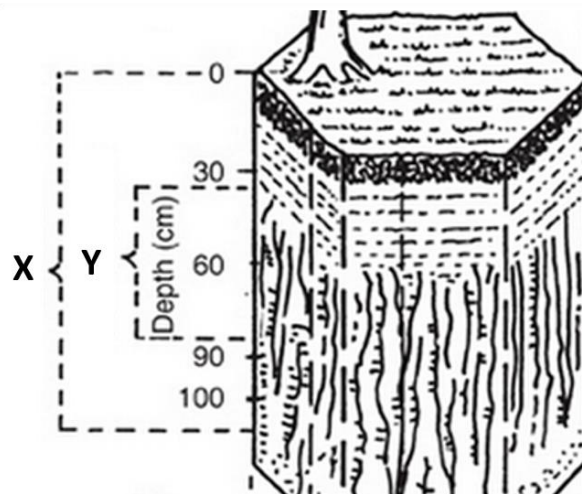b) Discuss any two (2) water transported parent materials. **[10 marks]**

Question 4 [25 marks]

Use the figure below to answer questions a) and b):

a) Describe the following, and identify them from the picture below: **[4 marks]**

   i)   Solum
   ii)   Control section

b) Which one between solum and control section is used in determining particle size
   class of the soil family name and why?   **[7 marks]**

c) What are diagnostic soil properties?   **[2 marks]**

d) Mention and describe any two (2) types of horizons for each of the following:

   i. Diagnostic epipedons   **[6 marks]**
   ii. Diagnostic sub-surface horizons   **[6 marks]**

Section B: Compulsory

Question 5 [25 marks]

Using the information shown in soil description (next page) provide the following about the soil:

a) Diagnostic epipedon and indicate the data used to justify your answer. **[5 marks]**

b) Diagnostic subsurface horizon and indicate the data used to justify your answer.

[5 marks]

c) Soil order and indicate the data used to justify your answer   **[5 marks]**

d) Family particle size class   **[5 marks]**

e) A possible soil family name   **[5 marks]**
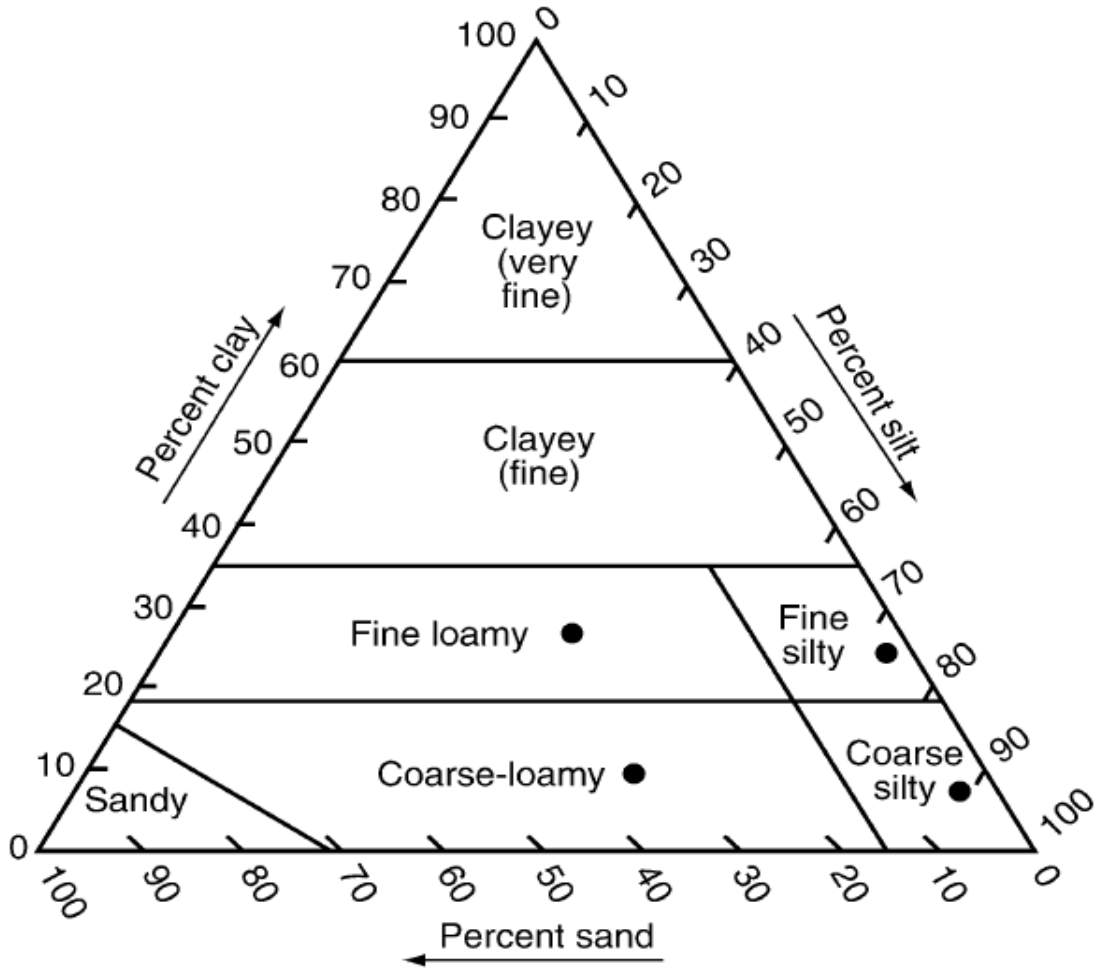
Soil description

Ap   0-28 cm, black (10YR 2/1) sandy clay loam; weak medium granular structure with very coarse clods; friable, sticky and plastic; many very fine roots; many very fine pores; slightly acid; abrupt smooth boundary

Bt1   28-59 cm, very dark gray (10RY 3/1) clay loam; strong medium and coarse blocky structure arranged in weak coarse prisms; firm, sticky and very plastic; common very fine and few fine roots; many prominent black (10YR 2/1) clay films; neutral; clear wavy boundary

Bt2   59-102 cm, dark brown (10YR 3/3) sandy clay loam; strong medium and coarse blocky structure arranged in weak coarse prisms; firm, sticky and very plastic; many prominent black (N2/0) clay films; neutral; clear irregular boundary.

BCt   102-132 cm, yellowish brown (10YR 5/6) very fine sandy loam; moderate medium and coarse blocky structure arranged in weak coarse prisms; friable, sticky and plastic; few fine roots; many prominent dark yellowish-brown (10YR 3/4) clay films; neutral; gradual wavy boundary

2C   132-176 cm, dark yellowish brown (10YR 4/4) very fine sandy loam; massive; friable, slightly sticky and slightly plastic, many very fine pores; neutral.

Geographic setting: Found on smooth terraces. The slope gradient is commonly 0-2% but ranges from 0-7%. Mean annual temperature is 16^0 C and mean annual precipitation ranges from 625 – 800 mm. The soils are formed in alluvium dominantly of basalt origin. There is no dominant clay mineral.

Selected laboratory Data

Depth (cm)	Horizon	Clay%	Silt%	Sand%	Organic C	BS%
0-25	Ap	24.3	26.3	49.4	1.25	74
25-59	Bt1	38.6	23.9	37.5	1.55	84
59-102	Bt2	23.4	23.4	53.2	1.55	87
102-132	BCt	18.7	24.4	56.9	0.44	90
132-176	2C	9.7	23	67.3	0.29	91

Particle size class triangle