



MACHAKOS UNIVERSITY

University Examinations for 2019/2020 Academic Year

SCHOOL OF AGRICULTURAL SCIENCES

DEPARTMENT OF AGRICULTURAL EDUCATION AND EXTENSION

FOURTH YEAR SECOND SEMESTER EXAMINATION FOR

BACHELOR OF ENVIRONMENTAL STUDIES (ENVIRONMENTAL RESOURCE
CONSERVATION)

AGN 352: SOIL AND WATER CONSERVATION

DATE: 26/10/2020

TIME: 8.30-10.30 AM

INSTRUCTIONS:

Answer *ALL* questions from Section A and any other *TWO* from Section B:

SECTION A: COMPULSORY: (30 MARKS)

- a) Explain four major constraints to soil and water conservation in Kenya. (4 marks)
- b) Describe four importance of soil structure to soil management (4 marks)
- c) Explain four factors considered in selection and design of physical soil and water conservation structures (4 marks)
- d) Define the following runoff processes:
 - i. Overland flow (2 marks)
 - ii. Interflow (2 marks)
 - iii. Base flow (2 marks)
- e) With an aid of a diagram, discuss the components of water harvesting systems. (4 marks)
- f) Describe four soil and water conservation measures that can be undertaken to reduce or eliminate the risks of landslides. (4 marks)
- g) Distinguish between consolidation and subdivision of land as used in surveying and mapping. (4 marks)

SECTION B: ANSWER ANY TWO QUESTIONS (40 MARKS)

QUESTION TWO (20 MARKS)

- a) A sample pit was dug to analyse the structural analysis of soil in Machakos University. With an aid of a diagram, describe the three phases that was analysed in the dug pit. (6 marks)
- b) Discuss four properties lost during erosion leading to lose of soil productivity. (4 marks)
- c) A moist sand sample has a volume of 464cm^3 in the natural state and a weight of 793g. The dry weight is 735g and the specific gravity of the soil particles is 2.68.

Determine:

- i. Porosity (3 marks)
- ii. Soil moisture content (3 marks)
- iii. Volumetric moisture content (2 marks)
- iv. Degree of saturation (2 marks)

QUESTION THREE (20 MARKS)

- a) Some combinations of factors that may influence the sensitivity and resilience of land systems is described in a matrix. By illustration on a matrix, show the sensitivity and resilience of the following factors:
- i. Vertisol and Luvisol Soil;
- ii. Low soil organic matter ‘
- iii. Drought deforestation;
- iv. Intensive rainfall;
- v. Steep slopes and (10 marks)
- b) A small tea farm in Murang’a shows susceptibility to land degradation due to excess rainfall. Discuss five different levels of analysing this susceptibility to land degradation. (10 marks)

QUESTION FOUR (20 MARKS)

- a) With aid of sketches, the following physical soil and water conservation structures.
- i. Cut off Drains (4 marks)
- ii. Retention Ditches (4 marks)
- b) Explain three type of errors experienced in the use of mapping and levelling instruments in determining the soil and water conservation site. (6 marks)

- c) Explain three factors that need to be considered during designing of water harvesting systems. (6 marks)

QUESTION FIVE (20 MARKS)

- a) Explain the four main errors that lead to observation errors in measuring precipitation. (8 marks)
- b) Rational Method is used in estimation of runoff water in an agricultural field for the design of culvert or any discharge structure. An 85 ha land collects water and discharges to a rangeland. With rainfall intensity of 8cm/hr and corresponding land use and runoff coefficient as given below.

Land Use	Area (Ha)	Runoff Coefficient
Roads	8	0.70
Lawn	17	0.10
Residential Area	50	0.30
Industrial Area	10	0.80

Calculate:

- i. Equivalent runoff coefficient (7 marks)
- ii. Runoff discharge (Q) (5 marks)