MACHAKOS UNIVERSITY

University Examinations for 2019/2020 Academic Year

SCHOOL OF AGRICULTURAL SCIENCES

DEPARTMENT OF AGRIBUSINESS MANAGEMENT AND TRADE

THIRD YEAR SECOND SEMESTER EXAMINATION FOR

BACHELOR OF SCIENCE IN AGRIBUSINESS MANAGEMENT

AGN 352: SOIL AND WATER CONSERVATION

DATE: 13/11/2020 **TIME: 2.00-4.00 PM**

INSTRUCTIONS;

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

SECTION A: COMPULSORY: (30 MARKS)

a) Explain four roles of soil structure in water storage and water availability as explained in soil and water conservation practises. (4 marks)

b) Define the following as it is used in soil and water conservation:

i. Sustainable land use (2 marks)

ii. Sensitivity (2 marks)

iii. Resilience (2 marks)

c) With an aid of a sketch explain how the following forms will impact flow in a river after a heavy downpour in Machakos town. (4 marks)

i. Interflow

ii. Base flow

d) Discuss the four sources of Errors in rain gauges (4 marks)

e) Describe any four soil and water conservation measures that can be undertaken to reduce or eliminate the risks of landslides. (4 marks)

f) Discuss four importance of water harvesting from a roof catchment to be used in one-acre farm. (4 marks)

g) Distinguish between GPS and Google Earth as used in surveying and mapping. (4 marks)

SECTION B: ANSWER ANY TWO QUESTIONS (40 MARKS)

QUESTION TWO (20 MARKS)

a) Runoff occur when the soil is fully saturated or after a heavy downpour. Discuss six factors affecting runoff in an agricultural land. (6 marks)

b) A sample pit was dug to analyse the structural analysis of soil in Machakos University. With the aid of a sketch, describe the soil phases that was used to analyse the *insitu* properties of soil. (6 marks)

c) Determine the weight of water (in kN) that must be added to a cubic meter of soil to attain a 95% degree of saturation, if the dry weight is 17.5kN/m^3, its moisture is 4%, the specific gravity of soils is 2.65 and the soil is entirely made up of a clean quartz sand. (8 marks)

QUESTION THREE (20 MARKS)

a) Discuss three factors that influences the likelihood of the occurrence of degradation (6 marks)

b) You are a soil and water conservation expert and you are to educate farmers in Machakos on macro-catchment structures. Discuss the three macro-catchment water-harvesting structures to be constructed in the area. (6 marks)

c) Discuss the surveying process to be followed when assessing the extent of degraded agricultural land. (8 marks)

QUESTION FOUR (20 MARKS)

a) Discuss three requirements for the selection and design of physical soil and water conservation structures. (6 marks)

b) Discuss the type of errors experienced in the use of mapping and levelling instruments in determining the soil and water conservation site. (6 marks)

c) Rational Method is used in estimation of runoff water in an agricultural field for the design of culvert or any discharge structure. A 210-acre 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 (Acre)**	**Runoff Coefficient**
Roads	20	0.70
Lawn	42	0.10
Residential Area	124	0.30
Industrial Area	24	0.80

Calculate:

i. Equivalent runoff coefficient (4 marks)

ii. Runoff discharge (Q) (4 marks)

QUESTION FIVE (20 MARKS)

a) Observation errors in measuring precipitation are caused by four main errors. List and discuss these errors. (8 marks)

b) Explain three methods of surveying that can be use in an agricultural land. (6 marks)

c) Rooftop systems collect and store rainwater from the roofs of houses or large buildings, greenhouses, courtyards, and similar impermeable surfaces, including roads. With a sketch of greenhouse, show the components of a roof catchment to be used in irrigation system. (6 marks)