MACHAKOS UNIVERSITY

University Examinations for 2016/2017

SCHOOL OF AGRICULTURE AND NATURAL RESOURCES MANAGEMENT

DEPARTMENT OF AGRICULTURAL EDUCATION AND EXTENSION

FOURTH YEAR FIRST SEMESTER EXAMINATION FOR BACHELOR OF SCIENCE IN AGRICULTURAL EDUCATION AND EXTENSION

AEN 416 SOIL AND WATER MANAGEMENT

DATE: 27/7/2017 **TIME: 11:00 – 1:00 PM**

INSTRUCTIONS

*Answer **ALL** questions in **SECTION A** and any other **TWO** questions in **SECTION B***

SECTION A (TOTAL 30 MARKS)

QUESTION ONE (COMPULSORY) (30 MARKS)

a) Define the following terms:

i. Direct ranging (2 marks)

ii. Saltation (2 marks)

iii. Rainfall Erosivity (2 marks)

iv. Land degradation (2 marks)

v. Structural measures (2 marks)

b) Difference between the starting elevation (BM_1) and end elevation (BM_2) of a fanya-juu terrace line is 0.008m. If the length of the terrace is 450m, calculate the error of closure and make your comment. (3 marks)

c) List five differences between geodetic and plain surveying. (5 marks)

d) The National Soil and Water Conservation Project (NSWCP), supported by the Swedish International Development Agency (SIDA) started in 1974. Explain why Machakos was chosen to be an excellent district for the pilot? (6 marks)

e) What are the assumptions made for the use of rational method? (2 marks)

f) The data below was obtained from a research station at Kalro, determine the runoff rate using rational method.

Runoff coefficient = 0.56

Area of the catchment = $201x10^3m^2$

Rainfall intensity = 41mm/hr (4 marks)

SECTION B: ANSWER ANY OTHER TWO QUESTIONS (40 MARKS)

QUESTION TWO (20 MARKS)

a) Outline briefly the steps of constructing soil and water conservation structure on agricultural land (8 marks)

b) Describe four forms of water erosion (8 marks)

c) The subtense bar was set up and levelled at point marked "A" and the theodolite was set up and levelled at point marked "B". The angle subtensed by the targets on the bar was carefully read as 18.24^0. If invar bar of the subtense bar was exactly 2.00m long, determine the distance between A and B (4 marks)

QUESTION THREE (20 MARKS)

a) Define the following terms as commonly used in surveying.

i. Back sight

ii. Minus sight

iii. Benchmark

iv. Intermediate sight

v. Turning point (10 marks)

b) The following levels were taken using a metric levelling staff and a dumpy level, on a series of pegs planted 20.00m apart along a line for a proposed water channel. 2.10 (on TBM1), 2.85, 3.51, 1.80, 1.58, 2.24, 2.94, 1.68, 2.27, 3.06 and 3.81 (on TBM2). The instrument was changed after 3rd and 7th readings. Book the above entries in a field level book, reduce the levels for all the stations and perform the arithmetic check (Assume the elevation of TBM1 to be 100.00m above m.s.l (10 marks)

QUESTION FOUR (20 MARKS)

a) State the components of the Universal Soil Loss Equation (USLE) (6 marks)

b) Explain how the following cultural methods conserve soil and water:

i. Mulching

ii. Early planting

iii. Minimum tillage (6 marks)

c) A farm measures 230m along a slope of 9% and 120m along the contour. Take rainfall factor and soil erodibility factor to be 4 and 2 respectively. If a farmer wants to lay terraces on this farm, determine his findings on the following:

i. Vertical Interval (VI) (2 marks)

ii. Horizontal Interval (HI) (2 marks)

iii. Number of terraces (2 marks)

iv. Discharge by each terrace into the waterway given the intensity and runoff coefficient as 130mm/hr and 0.5 respectively. (2 marks)