



**UNIVERSITY OF SWAZILAND
FINAL EXAMINATION PAPER**

PROGRAMMES: BSC ABE 3 AND BSC AG ED 3

COURSE CODE: ABE 301

TITLE OF PAPER: SOIL AND WATER CONSERVATION

TIME ALLOWED: TWO (2) HOURS

SPECIAL MATERIAL REQUIRED: NONE

INSTRUCTIONS: ANSWER QUESTION ONE AND ANY TWO
OTHER QUESTIONS.

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GRANTED BY THE CHIEF INVIGILATOR**

SECTION A. COMPULSORY QUESTION**Question One**

- a. Using the rationale method, determine the peak flow of a 10 year return storm of 105 mm/hr, on a dairy farm. Twenty four hectares of the farm is a meadow and is well managed, while 26 ha of the farm is under maize cultivation. The rows are spaced 60 cm apart and grass strips are used for soil conservation purposes. The soil groups for the different portions of the farm are B and C respectively and soil conditions are good.

$$[q = 0.0028CiA]$$

10 marks

- b. Design a parabolic waterway (based on MANNING's formula for velocity) to convey the peak runoff of 7m³/s if the slope of the area is 2.1%, permissible velocity 1.5m/s and the roughness coefficient is 0.35. Allow a 20 % freeboard.

$$V = \frac{R^{2/3} S^{1/2}}{n}$$

20 marks

- c. Give a brief description of waterways and their operation and management for effective soil conservation.

10 marks**SECTION B. ANSWER ANY TWO QUESTIONS****Question two**

- a. Explain the importance of the following soil and water conservation measures highlighting the conditions where they are most applicable.
- i. Tied ridges /6
 - ii. Bench terraces /6

12 marks

- b. Briefly discuss the limitations of mechanical soil conservation practices.

8 marks

- c. Using the Zimbabwe method, determine the recommended spacing between terraces constructed on highly erodible soils with an average slope of 1.8° and the soil erodibility factor 3. Express your answer in metres.

10 marks

Question three

- a. what are the five important factors considered the amount of rain water to be harvested from a rooftop? /10
- b. Describe four factors considered when determining the water demand for a house hold. /8

18 marks

- c. Explain the relevance of the following factors considered when estimating the amount of soil loss in an area using the USLE;
 - i. Soil management
 - ii. Rainfall erosivity
 - iii. Soil erodibility

12 marks

Question four

- a. Describe using examples, how the conservation agriculture system is better that the conventional system of farming.
15 marks
- b. Describe how the following conditions influence the amount of run-off water
 - i. Row crop
 - ii. Forested areas
 - iii. Bare soil

15 marks