



UNIVERSITY OF SWAZILAND
FINAL EXAMINATION PAPER

PROGRAMMES : BSC AGRICULTURAL AND BIOSYSTEMS

ENGINEERING YEAR III

COURSE CODE : ABE 301

TITLE OF PAPER : SOIL AND WATER CONSERVATION

TIME ALLOWED : TWO (2) HOURS

INSTRUCTIONS : ANSWER QUESTIONS ONE AND ANY TWO

OTHER QUESTIONS

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GRANTED BY THE CHIEF INVIGILATOR.**

SOIL AND WATER CONSERVATION**Question 1: Compulsory**

- (a) Give two factors that affect bulk density and explain how this is achieved. [10 marks]
- (b) Differentiate between the two terms as used in soil and water conservation. "The 3 phase soil system" and "The 3-phase Erosion System". [10 marks]
- (c) In most soils where the land is sloping or the soil is somewhat impermeable to water, a considerable amount of precipitation is likely to be lost as a runoff. This loss has two serious effects. What are they? [10 marks]
- (d) You are given a soil sample and you are told the soil has 30% pore spaces which can hold 80mm if water. Two days after a heavy storm that saturated soil, is found that there is 80% of water retained in the pores. Seven days after the rain, the plants grown on the soil start wilting and the moisture content is 20%. Calculate the field capacity, wilting point and the total available moisture. [10 marks]

TOTAL = [40 marks]

Question 2

- (a) How much water that would be collected from a top with the following dimensions, 2x (6.0m x 4.0 m) plus 2x(4.0m x 3.0 m) after a storm that gave 80mm of rainfall. Assume a roof top coefficient of 0.9. [10 marks]
- (b) How many days will the collected amount of water supply three households if each household has five members and each member consuming 30 litres per day? [5 marks]
- (c) Define the term "porosity" as used in soil and water conservation studies. [15 marks]

TOTAL = [30 marks]

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Question 3

(a) Design a trapezoidal grass waterway to convey a peak flow of $10.0\text{m}^3/\text{sec}$ on a 1% slope over an erodible soil with grass vegetation which stands in a good cut to 5 cm height. The roughness coefficient is 0.035 and the velocity of flow is $2.0\text{m}/\text{sec}$. add 18% free board
[20 marks]

(b) Define the following terms as used in soil and water conservation:

(i) Runoff [5 marks]

(ii) Soil Erosion [5 marks]

TOTAL = [30 marks]

Question 4

(a) You are two catchments; first one has a gentle slope, good soil with average infiltration rate with heavy vegetation cover. The second catchment has heavily compacted soil and tarred surfaces with steep slope. Give three reasons why the second catchment had high volume of runoff at the ganging point than the first catchment. [15 marks]

(b) Give and discuss three factors that affect the amount of soil eroded in a given catchment. [15 marks]

TOTAL = 30 marks]