



**UNIVERSITY OF SWAZILAND
FINAL EXAMINATION PAPER**

**PROGRAMMES : BSC AGRICULTURAL AND BIOSYSTEMS
ENGINEERING YEAR III AND AGRIC
EDUCATION 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
FINAL EXAMINATION

Question 1: Compulsory

(a) Mulching is one of the techniques used to conserve moisture, explain the science behind this techniques i.e. how it achieves the purpose. **[10 marks]**

(b) The use of runoff water for irrigation projects offers great possibilities where there are no running rivers and in some areas it is the only possible means of obtaining water for irrigation. You are given a project to manage and a consultant is hired to design the storage facilities of the project. The following information is given to the consultant;

- Slope of the catchment 2.5 %
- Soil type of the catchment Clay loam
- Catchment area 15,000 ha
- Crop to be grown Sugar Cane
- Area to be irrigated 300 ha
- Crop Evapotranspiration (ETC) 8.0 mm / day
- Season to be Considered Summer

(i) You are required to calculate the amount of water to be stored for three month in summer. Keep the crop evapotranspiration constan and the evaporation seepage losses in the day are 30 %. **[10 marks]**

(ii) Calculate the flow of water if this water is delivered by pipes into the irrigated area at 100 % efficiency i.e. no leaks along the pipeline. **[10 marks]**

(c) List three main objectives of mechanical soil conservation works. **[10 marks]**

Question 2

(a) A laboratory test carried out on an undisturbed sample of soil weighing 1.74 kg and having a volume of 1/1000 m³ determined the specific gravity of the solids to be 2.7 and dry density of the soil to be 1500 kg / m³.

Calculate;

- (i) the moisture content **[5 marks]**
- (ii) the void and porosity **[10 marks]**
- (iii) the degree of saturation **[5 marks]**

(b) Briefly describe two types of erosion and give two ways by which they can be controlled. **[10 marks]**

Question 3

- (a) Name and discuss three factors that affect water erosion. [15 marks]
- (b) Discuss the effects of soil erosion on water quality. [10 marks]
- (c) Briefly explain in less than half a page what is meant by the term **THREE-PHASE SOIL SYSTEM**. [5 marks]

Question 4

- (a) Give four reasons why do we bother about soil and water conservation. [10 marks]
- (b) Design a trapezoidal grass water way to convey a peak flow of 10.0 m³ / sec on a 1.0 % slope over an erodible soil with grass vegetation, which stands in a good stand cut to 5 cm height. Allow an 18 % freeboard. The roughness coefficient is 0.035 and velocity to be 2.0 m / sec [15 marks]
- (c) Define the phrase “Time of Concentration” as used in run-off estimation in water conservation. [5 marks]