



**UNIVERSITY OF SWAZILAND
SUPPLEMENTARY 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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THE CHIEF INVIGILATOR**

SECTION A: COMPULSORY QUESTION**QUESTION 1**

- a. Discuss the four (4) factors considered when designing a grass waterway to convey runoff water to a natural stream, highlighting how such factors are used in the design of waterways. **[20 marks]**
- b. Agronomic management is used as a soil conservation technique; discuss four (4) methods used in this technique. **[20 marks]**

SECTION B: ATTEMPT ANY TWO (2) QUESTIONS**QUESTION 2**

The rainfall data in the table below is monthly average for the city of Mbabane from 1997 to 2007.

Month	Average rainfall (mm)
January	166.7
February	158.04
March	130.65
April	65.04
May	22.07
June	15.61
July	12.54
August	16.14
September	44.17
October	98.80
November	159.17
December	179.09

Assume that Mbabane has an average roof area of 50 m^2 , and that most of the roofs are corrugated iron ($C = 0.8$). If the average household size is six people (6), and water consumption is 20 liters/head/day, determine;

- i. the daily household consumption rate (liters/day) **[5 marks]**
- ii. the annual rooftop water yield (m^3) **[5 marks]**
- iii. utilization period (days) **[5 marks]**
- iv. using the tabular method, minimum storage tank (m^3) **[15 marks]**

QUESTION 3

- a. Discuss the applications of the SLEMSA model and clearly state how different is its application to that of the WEPP model. **[10 marks]**
- b. Calculate the total energy derived from the information in the Table below;

Time (hr:min)	Rainfall (mm)	Intensity (mm/hr)	Kinetic energy ($Jm^{-2}mm^{-1}$)	Total energy (Jm^{-2})
9:50				
10:05	1.5			
10:20	14.2			
10:35	26.2			
10:50	31.5			
11:05	8.4			
11:20	0.3			

[20 marks]

QUESTION 4

- a. Describe the effects of the following on the rate of water erosion;
 - i. Rain drop **[5 marks]**
 - ii. Length of slope **[5 marks]**
 - iii. Contour strip **[5 marks]**
- b. Discuss the effects of soil erosion on water quality. **[15 marks]**

APPENDIX

$$E_j = 29(1 - 0.72e^{-0.05I_{15}})$$