

1st SEM.2006/2007

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**UNIVERSITY OF SWAZILAND
FINAL EXAMINATION PAPER**

PROGRAMME: DIP IN AGRIC 3, DIP IN AGRIC EDUC 3

COURSE CODE: LUM 302 (OLD PROGRAMME)

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 1**

a. A soil sample was taken from a maize field with an effective depth of 100 cm using a core ring (diameter 50 mm and length 60 mm). The sample weighed 175g and after drying for 24 hours, it weighed 60g. The weight of the container was found to be 40g. Given that the water density is 1g/cm^3 , calculate the following;

- i. Volume of the soil sample
- ii. Soil bulk density
- iii. Volumetric water content
- iv. Amount of water in the sample

20 marks

b. What effect does soil texture has on bulk density and how does this relate soil erosion?

10 marks

c. Give an in-depth description of the effect of vegetation on surface water runoff.

10 marks**SECTION B. CHOOSE ANY TWO QUESTIONS****QUESTION 2**

a. A farmer wanted to harvest water that collected over a 35.0 ha catchment area having sandy loam soil which was relatively flat and fair with a coefficient of 0.5, while 20.0 ha of the catchment area was clay, hilly and good with a coefficient of 0.65. Given that the rainfall intensity was estimated to be 100mm/h, calculate the peak run-off rate using the rational formula.

10 marks

b. Describe the four 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 the waterway.

20 marks

QUESTION 3

Describe the following concepts as used in soil and water conservation.

- i. Terraces
- ii. Terrace channels and Waterways
- iii. Runoff water

30 marks

QUESTION 4

- a. With the aid of a diagram, describe the different stages during formation of a donga. **20 marks**
- b. The infiltration rate of a field was monitored as a function of cumulative rainfall and was found to be 25mm/h when a total of 100 mm had infiltrated. If the eventual steady rate of infiltration was 5mm/hr, estimate the cumulative infiltration at rates 15 mm/hr and 8 mm/hr using the Green-Ampt equation $[i(t) = ic + b/I]$ **10 marks**