UNIVERSITY OF SWAZILAND
SUPPLEMENTARY EXAMINATION PAPER

PROGRAMME: BSC AGRIC III (ABE)

COURSE CODE: ABE 304

TITLE OF PAPER: RURAL WATER SUPPLY AND HYDROLOGY

TIME ALLOWED: TWO (2) HOURS

INSTRUCTIONS: ANSWER QUESTION ONE AND ANY TWO OTHER QUESTIONS.

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SECTION I: COMPULSARY

QUESTION 1

A) i. Explain the "**continuity principle**" in hydraulics. **(5 marks)**

ii. Water flows from a tank into a pipe at a rate of **1.0 L/s**. Calculate the velocity of entrance into the pipe if the internal diameter of the inlet is **40 mm**.

(5 marks)

iii. The pipe does not maintain its size as its outlet has a diameter of **45 mm**; calculate the new velocity at that section of the pipe. **(4 marks)**

B) i. Discuss **four (4)** materials that have been or are still being used in making pipes.

(8 marks)

ii. **Friction losses** are incurred as water moves along a pipe system. How much is lost depends on several factors. Discuss at least **three (3)**. **(8 marks)**

C) The Swaziland Water Services Cooperation has the responsibility to provide metered water supply to urban areas in Swaziland. Discuss what challenges it could face if it had to extend this service to the rural areas in Swaziland. **(10 marks)**

[40 marks]

SECTION II: ANSWER ANY TWO QUESTIONS

QUESTION 2

A) Discuss briefly the information that is required to determine the water demand requirements for a small rural community. **(15 marks)**

B) A small rural community of **15 000** people in the Lowveld of Swaziland had water requirements of **40 l/h/d** with a peak day factor (PDF) of **1.2**. Calculate the design capacity for this community in **m³/day** and **m³/ h**. **(10 marks)**

C) What kind of material could be recommended for the construction of the water storage tank for the community water supply? **(5 marks)**

[30 marks]

QUESTION 3

Briefly discus the following concepts as used in rural water supply.

    i.   Roof water harvesting.   **(10 marks)**

    ii.   Water collected from streams.   **(10 marks)**

    iii. Ground water extraction.   **(10 marks)**

                               [30 marks]

QUESTION 4

A) Briefly describe the **two (2)** water bodies that could be used for rural water supply intake to channel water for domestic applications?   **(6 marks)**

B) **Figure 1** shows **spot heights** of a **levelling grid** for an excavated water reservoir site intended for use as a pond for water storage.
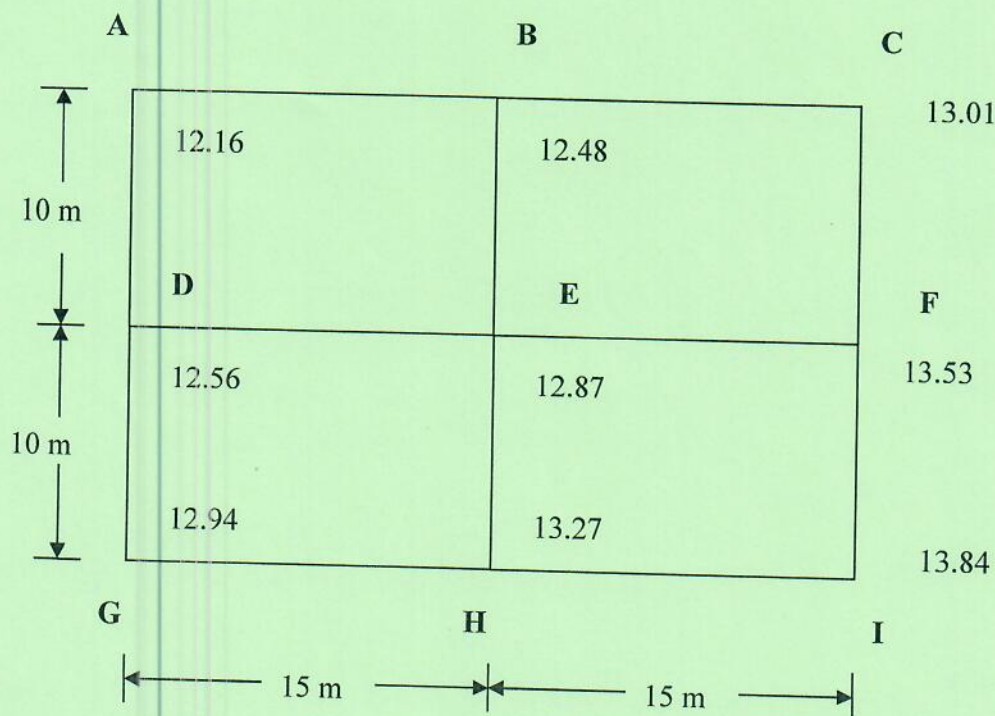

Figure 2. Reservoir spot heights for a levelling grid

i. If the excavated reservoir is to have a uniform depth of **8.0 m above datum**, calculate the mean level using **Equation 1** and a table similar to **Table 1**.

(8 marks)

$$\text{Mean level} = \frac{\Sigma(RL \times n)}{\Sigma n} \quad (1)$$

Table 1. Volume calculation from spot height levelling grid

Station	Reduced level (RL) (m)	Number of Times RL is used (n)	Product (RL x n) (m)
Total			

ii. Calculate the depth of excavation.

(8 marks)

iii. Calculate the volume of excavation.

(8 marks)

[30 marks]