UNIVERSITY OF SWAZILAND
FINAL EXAMINATION PAPER

PROGRAMME: BSC AGRIC III (LWM)

COURSE CODE: LUM 304 (NEW PROGRAMME)

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) An earth dam is to be constructed to provide storage of at least 120, 000 m^3 of irrigation water. The catchment from which the water will be obtained has a total size of 144 ha of sandy clay soil. The catchment is 800 m wide, and has a maximum length of 1800 m with a slope of 10 m fall over the full length. The area receives an average rainfall of 800 mm/year. The rainfall intensity for the catchment area is 100 mm/h with a runoff coefficient of 0.36.

i. Determine if the catchment is capable of providing enough water for the required storage of 120, 000 m^3. **(See Table 1.1).** **[10 marks]**

ii. Calculate the design peak runoff to accommodate the 100 mm/h storm. **[10 marks]**

$$Q = \frac{CiA}{360} \quad (1)$$

B) i. Name the three (3) types of earth dams. **[6 marks]**

ii. Briefly discuss the role of water storage in land and water management. **[14 marks]**

Table 1.1. Runoff from catchment areas

Average rainfall, R (mm)	Total annual evap. (mm)	Reliability (yrs out of 10)	Runoff as a % of average rainfall, Y			
			Shallow sand or loam soils (%)	Sandy clays (%)	Elastic clays	Clay pans, inelastic clays or shales (%)
> 1100	-	8	10 – 15	0 – 15	15 – 20	15 - 25
	-	9	6.5 – 10	6.5 – 10	10 – 13	10 – 16.5
	-	8	10 – 12.5	10 – 15	12.5 – 20	15 - 20
	-	9	6.5 – 8	6.5 – 10	8 – 13	10 - 13
901 - 1100	-	8	10-12.5	10 – 15	12.5 – 20	15 – 20
	-	9	6.5 – 8	6.5 – 10	8 – 13	10 - 13
501 – 900	< 1300	8	7.5 -10	7.5 – 15	7.5 – 15	10 - 15
		9	5 – 6.5	5 – 10	5 – 10	6.5 - 10
	1300-1800	8	5-7.5	5-12.5	5-10	10-15
		9	3-5	3-8	3-6.5	6.5-10
401-500	1300-1800	8	2.5-5	5-10	2.5-5	7.5-12.5
		9	1.5-3	3-6.5	1.5-3	5-8
250-400	<1800	8	0-2.5	0-5	0-2.5	2.5-7.5
		9	0-1.5	0-3	0-1.5	1.5-5
	≥1800	8	0	0-2.5	0	2.5-5
		9	0	0-1.5	0	1.5-3

Source: Nelson (1985)

SECTION II: ANSWER ANY TWO QUESTIONS

QUESTION 2

What are the possible sources of pollution in the following?

i. Water harvested from roof tops **[10 marks]**
ii. Water collected from streams **[10 marks]**
iii. Ground water **[10 marks]**

QUESTION 3

Discuss the major potentials and challenges of promoting water harvesting technologies for domestic use in Swaziland **[30 marks]**

QUESTION 4

Discuss the major impacts of agricultural activities on the quality of water in Swaziland **[30 marks]**