MAASAI MARA UNVERSITY

REGULAR UNIVERSITY EXAMINATIONS

2023/2024 ACADEMIC YEAR

FIRST YEAR SECOND SEMESTER

SCHOOL OF NATURAL RESOURCES, ENVIRONMENTAL STUDIES AND AGRICULTURE

BACHELOR OF EARTH SCIENCES

COURSE CODE: ESC 1207-1

COURSE TITLE: INTRODUCTION TO HYDROLOGICAL PROCESES AND MONITORING

DATE: 14/5/24 **TIME: 0230-0430HRS**

INSTRUCTIONS TO CANDIDATES

Answer **ALL** questions in Section A, and any **TWO** questions in Section B

Use illustrations where appropriate. A simple calculator required during this examination. Borrowing of any materials from others is strictly not allowed.

This paper consists of 3 printed pages. Please turn over

SECTION A (ANSWER ALL QUESTIONS)

Q1

a) Explain how these river basin characteristics may be determined.

i)Basin length (**2 marks**)

ii)Average annual temperature (**2 marks**)

b) Describe one methods that you would recommend for the exploration of groundwater resources in your home area. (**2 marks**)

d)Using your own hypothetical data and a suitable sketch, demonstrate how this equation above could be used to estimate missing evaporation data. (**4 marks**)

$$Px = \frac{Nx}{m}\left[\frac{P1}{N1} + \frac{P2}{N2} + \cdots + \frac{Pm}{Nm}\right]$$

e) An earth sciences student wished to establish the rating curve at station located under a bridge near their residence. The student obtained some data for one year on the height of water level above a local datum (metres) and the corresponding volume of discharge (Cumecs) from the office of the Water Resources Authority in their town. Using the data assist this student to answer the questions that follow.

Height of water level H (Metres)	**Volume of discharge, Q (Cumecs)**
0.9	1.7
1.3	3.7
1.6	6.8
1.9	10.2
2.2	15.3
2.3	19.1
2.5	22.1
2.7	26.5
2.8	29.2
2.9	32.3

i)What is the value of coefficient a (**2 marks)**

ii)What is the value of the coefficient b (**2 marks**)

iii)Obtain an estimate for the height of water level H when the volume of discharge is zero. (**2 marks)**

iv)describe two factors that could cause significant changes to the rating curve (**4 marks**)

SECTION B (ANSWER ANY TWO QUESTIONS)

Q2 Design an experiment that one could use in a college laboratory to demonstrate any THREE water characteristics. Describe the apparatus, the procedures and the expected observations and conclusions. (**15 marks**)

Q3 You have participated in a one-day academic visit to one of the following nearby environmental sites indicated in the table below.

A water-pan that belongs to one homestead but is open to the public	A county meteorological station owned by the government
A subsistence farmer with a model rainwater harvesting system	A commercial tree nursery managed by a high school geography club.

Write-up a typical field visit report under the following sub-headings;

a) Introduction (**3 marks**)
b) Description of the site (**3 marks**)
c) Observations (**3 marks**)
d) Conclusions (**3 marks**)
e) Recommendation (**3 marks**)

Q4] Describe the hazards that one should expect during the construction and maintenance of residential septic tank. (**15 marks)**

Q5 Discuss the factors that may influence evaporation over a large fresh water body like Lake Naivasha in Kenya. (**15 marks)**

Q6) a) Make a sketch of a typical stream hydrograph. (**3 Marks**)

b) Indicate the sections that represent effective rainfall, sub-surface flow and base flow. (**6 marks)**

c) Explain how some THREE environmental factors affect the volume of sub-surface flow. (**6 marks**)

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