



TECHNICAL UNIVERSITY OF MOMBASA

SCHOOL OF ENGINEERING AND TECHNOLOGY

Department of BUILDING & Civil engineering

UNIVERSITY EXAMINATION FOR:

BACHELOR OF SCIENCE IN CIVIL ENGINEERING

ECV 4422: HYDROLOGY 11

END OF SEMESTER EXAMINATION

SERIES: AUGUST 2024

TIME: 2 HOURS

Instructions to Candidates

You should have the following for this examination

-Answer Booklet, examination pass and student ID

This paper consists of **five** questions.

Attempt question ONE (Compulsory) and any other TWO questions.

Do not write on the question paper.

QUESTION ONE (COMPULSORY)

(30marks)

Question One (Compulsory)

- a) Discuss **FOUR** activities that could influence base flow. **(8 marks)**
- b) The ordinates of 1-hr UH from a watershed are given in Table 1 below.
- i) Using direct runoff, derive a 2-hr UH, as well estimate the area of the watershed. **(6marks)**

Time hr.	0	1	2	3	4	5	6	7
UH (m ³ /s.m)	0	1	15	40	20	7.5	2.5	1

- ii) Do the same calculation using the 2-hr UH ordinates. **(3marks)**
- c) Distinguish between a Unit hydrograph and a Synthetic Unit hydrograph. **(5marks)**
- d) Define a hydrograph. Discuss the components of a hydrograph. **(8 marks)**

Question Two

(20marks)

- a) Describe the factors affecting the nature of a hydrograph. **(10marks)**
- b) For a rectangular basin with a single drainage channel centrally located and flowing along the longer side of the basin, (length = 30km. width = 15km.). Define and compute

- i) Form factor.
- ii) Circularity ratio.
- iii) Elongation ratio.

(10 marks)

Question Three

(20marks)

- a) Outline the THREE dimensions that define a flood and how they can be used in the hydrologic design of structures. **(6marks)**
- b) A reservoir for detaining flood flows is 4.356 ha in horizontal area, has vertical sides and has 5m diameter reinforced concrete pipe as an outlet structure. The headwater discharge relation for the outlet pipe is given in table 1 below. i) Use the level pool routing method to calculate the storage – outflow function value. **(5marks)**

Table 1.

Elevation(m)	0	0.5	1	1.5	2	2.5	3	3.5	4	4.5	5	5.5	6	6.5	7	7.5	8
Discharge m ³ /s	0	3	8	17	30	43	60	78	97	117	137	156	173	190	205	218	231

8.5	9	9.5	10
242	253	264	275

Table 2.

Time(min)	0	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150
Inflow m ³ /s	0	60	120	180	240	300	360	320	280	240	200	160	120	80	40	0

- ii) Plot the storage-outflow function. **(4marks)**
- iii) Calculate the reservoir outflow from the inflow hydrograph in table 2. **(5marks)**

Question Four

(20marks)

- a) Define a flood. (2marks)
- b) Outline the concept of Reservoir routing or Level pool routing (6marks)
- c) Describe the main factors initiating and modifying floods. (6marks)
- d) Discuss the flood forecasting methods. (6marks)

Question Five (20marks)

- a) Describe the following;
 - i) Design storm. (3marks)
 - ii) Design Precipitation Intensity. (7marks)
- b) Discuss the measures for mitigating flood damage. (10marks)