



THE MOMBASA POLYTECHNIC UNIVERSITY COLLEGE

(A Constituent College of Jkuat)

*Faculty of Engineering and Technology in Conjunction with Kenya
Institute of Highways and Building & Technology (KIHBT)*

DEPARTMENT OF BUILDING AND CIVIL ENGINEERING

HIGHER DIPLOMA IN BUILDING AND CIVIL ECONOMICS

HYDRAULICS I

SEMESTER EXAMINATIONS

SERIES: AUGUST 2011

TIME: 2 HOURS

Instructions to Candidates:

You should have the following for this examination

- *Answer booklet*

This paper consists of **TWO** sections **I** and **II**

Section **I** has **30** marks and section **II** has 40 marks

Attempt all questions in section I and only **TWO** questions from section **II**

This paper consists of **THREE** printed pages

SECTION I – 30 marks

Question 1

- a) Define the following terms:
- i) Hydrology
 - ii) Hail
 - iii) Drizzle
 - iv) Rain
 - v) Rainfall intensity
 - vi) Isohyets
 - vii) Evapotranspiration
 - viii) Hydrograph
- (16 marks)
- b) With the aid of a sketch briefly describe the hydrological cycle (8 marks)
- c) Make a labeled sketch of a standard raingauge showing all important dimensions (6 marks)

SECTION II (Answer any TWO questions – 40 marks)

Question 2

- a) State **FOUR** factors considered when selecting a site for a raingauge station (4 marks)
- b) State **FOUR** advantages of recording raingauges (4 marks)
- c) Outline the procedure of calculating the depth of rainfall using a standard raingauge (4 marks)
- d) The rainfall data in table 1 were obtained for a catchment using Thiessen polygon method

Station	A	B	C	D	E
Polygon area (ha)	518	777	906	1495	748
Observed rainfall (mm)	267	198	142	114	81

Table 1

Estimate the average depth of rainfall in the catchment (8 marks)

Question 3

- a) Define the following types of streams
- i) Influent
 - ii) Effluent
 - iii) Intermittent
 - iv) Ephemeral
 - v) Perennial
- (10 marks)

- b) Briefly explain **FIVE** factors that influence the quantity of runoff from a catchment (10 marks)

Question 4

- a) The rainfall intensities for a certain storm were recorded at 20 minute intervals as follows:
2.5, 2.5, 10.0, 7.5, 1.25, 1.25, 5.0 cm/hr

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If the net index is 3.2cm/hr, construct a hyetograph and hence calculate:

- (i) The net runoff in cm
- (ii) Total rainfall
- (iii) Value of w-index (10 marks)

- b) Define the following terms

- i) Infiltration
- ii) Percolation
- iii) Infiltration capacity
- iv) Unit hydrograph
- v) Runoff coefficient (10 marks)

Question 5

- a) The data in table 2 was obtained during a stream flow measurement exercise

Distance from temporary Benchmark at the bank of the stream (cm)	0.5	1.5	3.3	5.1	7.1	9.3
Depth of vertical (m)	0	0.6	1.2	0.8	0.6	0
Mean velocity in vertical (m/s)	0	0.72	1.31	0.83	0.68	0

Table 2

Using the mean section method, calculate;

- (i) The stream flow
- (ii) The mean velocity of flow (14 marks)

- b) A well of 1.0m diameter penetrates fully into a confined aquifer of 20m thickness and a hydraulic conductivity of 8.2×10^{-4} m/s. The radius of influence is not to exceed 260m. If the drawdown in the well is not to exceed 3m, determine the maximum yield. (6 marks)

c)