



THE MOMBASA POLYTECHNIC UNIVERSITY COLLEGE

(A Constituent College of JKUAT)
Faculty of Engineering and Technology

DEPARTMENT OF BUILDING AND CIVIL ENGINEERING

DIPLOMA IN CIVIL ENGINEERING

DIPLOMA IN BUILDING & CIVIL ENGINEERING

EBC 2321: HYDROLOGY

SPECIAL/SUPPLEMENTARY EXAMINATION

SERIES: OCTOBER 2012

TIME: 2 HOURS

Instructions to Candidates:

You should have the following for this examination

- *Answer Booklet*
- *Electronic calculator*

This paper consists of **FIVE** questions. Answer any **THREE** questions

Maximum marks for each part of a question are clearly shown

This paper consists of **THREE** printed pages

Question 1 (30 marks)

- a) Define the following forms of precipitation
- (i) Drizzle
 - (ii) Rain
 - (iii) Hail
 - (iv) Sleet
 - (v) Fog
 - (vi) Glaze
 - (vii) Smog
 - (viii) Dew**
- (18 marks)**
- b) With the aid of a sketch, briefly describe the hydrological cycle **(8 marks)**
- c) State **FOUR** factors that affect precipitation at a specific location **(4 marks)**

Question 2 (20 marks)

- a) With the aid of a sketch, briefly describe the principle of the tipping bucket rain gauge **(8 marks)**
- b) The rainfall data in table 1 were obtained for a catchment using the Thiessen polygon method. Estimate the average depth of rainfall in the catchment **(8 marks)**

Station	A	B	C	D	E	F	G	H
Polygon area (ha)	18	31	282	311	52	238	212	197
Observed rainfall (mm)	16.5	37.1	48.8	68.3	39.1	75.7	127.0	114.3

Table 1

- c) Define the following terms:
- (i) Probable maximum precipitation
 - (ii) Recurrence interval of a storm
- (4 marks)**

Question 3 (20 marks)

- a) Make a labeled sketch of a USWB class A pan showing all salient dimensions **(6 marks)**
- b) Define the following terms
- (i) Infiltration capacity
 - (ii) Ephemeral stream
 - (iii) Intermittent stream**
- (8 marks)**
- c) The details of a catchment are as follows:
- (i) Area of catchment 7.0km²
 - (ii) Total number of streams 40
 - (iii) Total length of all streams 27.85 km
 - (iv) Length of main stream 6km
- Determine the following characteristics of the catchment **(6 marks)**
- (i) Drainage density
 - (ii) Stream density
 - (iii) Form factor

Question 4 (20 marks)

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

Distance from temporary Bm at bank of 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)	0	0.72	1.31	0.83	0.68	0

Table 2

Using the mean section method, calculate stream flow

(12 marks)

b) With the aid of a sketch, briefly explain the method of measuring surface velocity of an open channel using a surface float **(4 marks)**

c) With the aid of a sketch, outline the use of a rating curve for a river gauging station **(4 marks)**

Question 5 (20 marks)

a) Define the following terms:

(i) Hydrograph

(ii) Flood

(4 marks)

b) A well 0.5m diameter penetrates fully into an 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 drawn down in the well is not to exceed 3m, determine the expected maximum yield. **(6 marks)**

c) The values of annual precipitation at rain gauge stations, expressed in cm per year in chronological order from 1986 to 1997 are shown in table 3. Using Weibull formula ($T = (N+1)/M$). Estimate the maximum value of precipitation which has a recurrence interval of **(5 years)**

Yr	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
Precipitation (cm)	36.5	29.0	56.2	82.0	27.8	23.4	71.2	48.3	31.4	18.1	29.0	65.1