THE MOMBASA POLYTECHNIC UNIVERSITY COLLEGE

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

DEPARTMENT OF BUILDING AND CIVIL ENGINEERING

DIPLOMA IN BUILDING & CIVIL ENGINEERING

DIPLOMA IN CIVIL ENGINEERING

EBC 2321: HYDROLOGY

END OF SEMESTER EXAMINATION

SERIES: DECEMBER 2011

TIME: 2 HOURS

<u>**Instructions to Candidates:**</u>
You should have the following for this examination
- *Answer Booklet*

This paper consists of **FIVE** questions
Answer question **ONE (COMPULSORY)** from **SECTION A** and any other **TWO** questions from **SECTION B**
Maximum marks for each part of a question are clearly shown
This paper consists of **THREE** printed pages

SECTION A (COMPULSORY)

Question 1(20 marks)

a) With the aid of a sketch, briefly describe the hydrological cycle   (10 marks)

b) Define the following forms of precipitation
      (i)   Rainfall
      (ii)   Drizzle
      (iii)   Hail
      (iv)   Dew
      (v)   Sleet   (10 marks)

c) Sketch a standard raingauge and label all the parts indicating important dimensions   (6 marks)

d) Define the following terms:
      (i)   Evapotranspiration
      (ii)   Hydrology   (4 marks)

SECTION B (Answer any TWO questions from this section)

Question 2 (20 marks)

a) State **FOUR** factors considered when choosing a site for a raingauge station   (4 marks)

b) State **FOUR** advantages of recording raingauges   (4 marks)

c) State **FOUR** sources of errors when making rainfall measurements   (4 marks)

d) Define the following terms
      (i)   Areal rainfall
      (ii)   Mean annual rainfall
      (iii)   Isohyets
      (iv)   Interception loss   (8   marks)

Question 3 (20 marks)

a) A drainage basin has FIVE existing raingauge stations. The average annual precipitation at each station was recorded as shown in table 1.

Table 1

Station average annual precipitation	A	B	C	D	E
	41	45	90	80	54

Determine the optimum number of rainguages in the basin so as to limit the percentage error to within 10%   (10 marks)

b) The following data were obtained from rainfall data in a catchment using Thissen polygon
   method   (see table 2)

Table 2

Station	A	B	C	D	E
Polygon Area (ha)	748	906	77	1495	518
Observed rainfall mm	81	142	198	114	267

    (i)   Estimate the average depth of rainfall in the catchment

    (ii)   Estimate the total 'volume' of rainfall water received in m³ in the catchment   **(10 marks)**

Question 4 (20 marks)

a) Sketch and label a USWB class A pan showing salient dimensions   **(6 marks)**

b) State **FOUR** factors that affect the evaporation rate   **(4 marks)**

c) During a daily routine observation 10.8 litres of water were added to bring the water level in an evaporation pan to the stipulated (normal) level. A nearby rainguage measured 3.6mm of rainfall during the same period. Determine the evaporation depth for that day assuming that a pan with a diameter of 1206.5mm was used.   **(6 marks)**

d) Define the following terms:

    (i)   Infiltration capacity
    (ii)   Percolation   **(4 marks)**

Question 5 (20 marks)

a) The data in table 3 was obtained during a stream flow measurement exercise.

Distance from temporary B.m at the bank of the stream (m)	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

Using the mean section method, calculate:

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

b) (i) With the aid of a sketch, briefly describe the derivation of a rating curve for a stream.
    (ii) Outline the use of a rating curve in estimating stream flow.   **(6 marks)**