TECHNICAL UNIVERSITY OF MOMBASA

Faculty of Engineering & Technology

DEPARTMENT OF BUILDING & CIVIL ENGINEERING

HIGHER DIPLOMA IN BUILDING & CIVIL ENGINEERING (HDBCE 12J)

EBC 3120: HYDRAULICS

SPECIAL/SUPPLEMENTARY EXAMINATION
SERIES: OCTOBER 2013
TIME ALLOWED: 2 HOURS

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

This paper consists of **FIVE** questions.
 Answer any **THREE** questions
Maximum marks for each part of a question are as shown
This paper consists of **THREE** printed pages

Question One

a) Define the following forms of precipitation:
   (i) Drizzle
   (ii) Rain
   (iii) Snow
   (iv) Hail
   (v) Glaze   **(10 marks)**

b) Outline any **THREE** examples of use of data derived from the study of hydrology.   **(6 marks)**

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

Question Two

a) With the aid of a sketch, explain the working principle of 'tipping bucket raingauge" **(6 marks)**

b) The data in table 1 were obtained from a certain catchment. The Thiessen polygon areas were determined for each station. Estimate the average precipitation using:
   (i) Thiessen polygon method
   (ii) Arithmetic mean method   **(14 marks)**

   Table 1

Station	I	II	III	IV	V	VI	VII	VII
Thiessen Polygon Area (m^2)	170	164	156	150	116	36	124	42
Precipitation (mm)	93	105	109	122	135	140	142	128

Question Three

a) Make a labeled sketch of a "USWB class A pan"   **(6 marks)**

b) The data shown in table 2 were obtained from an evaporation pan in Nyeri. The standard cup used holds 0.5mm equivalent of rainfall.
   (i) Determine the evaporation rate for Nyeri for the period
      Table 2

Day	1	2	3	4	5	6	7
Rainfall mm	14	6	12	8	0	5	6
No. of cups removed	10	-	-	-	-	-	-
No. of cups added	-	-	-	-	14	8	6

(ii) Determine the evaporation loss in m³ during the same period from a nearby lake with an area of 640ha assuming a pan coefficient of 0.75. **(8 marks)**

c) In a certain catchment area, the daily precipitation was observed in eleven raingauge stations as shown in table 3. On a certain day, the observations indicated that one raingauge station was out of order. The normal annual precipitation of the other stations is within 10% of the average rainfall of the station out of order. Estimate the missing data at station H. **(6 marks)**

Question Four

a) A basin has an area of 26560km², a perimeter of 965km and an axial length of 230km. Determine:
   (i)   Form factor
   (ii)   Compactness coefficient
   (iii) Elongation ratio
   (iv)   Circularity ratio   **(10 marks)**

b) The data shown in table 4 was obtained during a stream flow exercise. Using the mean section method, determine the stream discharge   **(10 marks)**

Table 4

Distance from left bank (m)	0	2.2	4.2	6.0	7.8	8.8
Depth of vertical (m)	0	0.6	0.80	1.20	0.60	0
Mean velocity in vertical (m/s)	0	0.68	0.83	1.31	0.72	0

Question Five

a) With the aid of sketch, illustrate the following:
   (i)   Unconfined aquifer
   (ii)   Confined aquifer
   (iii) Artesian well
   (iv)   Perched water aquifer
   (v)   Ground water table   **(10 marks)**

b) In relation to ground water, define the following terms:
   (i)   Aquifer
   (ii)   Aquiclude
   (iii) Specific capacity of a well
   (iv)   Specific yield
   (v)   Transmissibility   **(10 marks)**