TECHNICAL UNIVERSITY OF MOMBASA

Faculty of Engineering and Technology
Department of BUILDING & Civil engineering
UNIVERSITY EXAMINATION FOR:
BACHELOR OF SCIENCE IN CIVIL ENGINEERING

ECE 2402 : HYDROLOGY I
SPECIAL/SUPPLEMENTARY EXAMINATION
SERIES: SEPTEMBER 2018
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) 30 Marks
a)   (i) Explain stream gauging
          (ii) Briefly explain the term 'rating curve'   **(6 marks)**
b) Outline the considerations in selecting a stream gauge station   **(6 marks)**
c) Explain with a neat sketch the method of measuring the velocity at a point in a stream using a
current meter.   **(8 marks)**

d)   The yearly rainfall in Stations A and Reference stations is given below.
(i)   Check the validity of rainfall from station A.
(ii)   Explain possible reasons for any possible discrepancy.

                                                                    (10 marks)

YEAR	STATION A RAIN(mm)	REFERENCE STATIONS RAIN(mm)
1997	976	1074
1998	734	807
1999	1048	1153
2000	988	1086
2001	812	893
2002	810	891
2003	604	665
2004	1050	1155
2005	740	814
2006	786	864
2007	616	1109
2008	760	1368
2009	775	1395
2010	856	1542
2011	652	1173
2012	882	1588
2013	848	1526
2014	624	1123
2015	621	1118
2016	949	1709
2017	926	1668

ANSWER ANY TWO QUESTIONS FROM THIS SECTION
QUESTION TWO (20 Marks)

a) (i)   Briefly discuss observation errors in the measurement of precipitation

(ii)   Differentiate between recording and non - recording type of rain gauges.

(10 marks)

b) (i)   List 6 types of hydrologic lossess

(ii)   A catchment has 8 rain gauges of which one is self-recording type and 7 are the standard type. For a 5% error in the estimation (E) of the mean rainfall, determine the required number of additional rain gauges, if annual precipitation at the stations are.

Station	A	B	C	D	E	F	G	H
Rainfall (cm)	74	87	94	88	104	118	60	95

(10 marks)

QUESTION THREE (20 Marks)

a) Explain with a neat sketch, the area-velocity method of discharge measurement.

(4 marks)

b) (i) In order to compute the flood discharge in a stream by the slope-area method the following data has been obtained.

	Upper section	Middle section	Lower Section
Area	108,6 m^2	103.1m^2	99.8 m^2
Wetted Perimeter	65.3 m	60.7 m	59.4 m
Gauge reading	+316.8		+316.55

Determine the flood discharge assuming manning's n=0.029 and the length between the upper and lower section is 250m   **(6 marks)**

b) Differentiate between the following terms

(i)   Aquifer , Aquiclude, Aquitard and Aquifuge.

(ii)   Porosity, Permeability, Hydraulic conductivity
(iii)   Distinguish between confined and unconfined aquifer   **(10 marks)**

QUESTION FOUR (20 Marks)

a) Explain:
(i)   Three mechanisms needed for the formation of precipitation.
(ii)   Frontal precipitation   **(8 marks)**

b) Differentiate between recording and non-recording types of rain-gauges.

(4 marks)

c) The catchment of an area approximated by a circle with the centre at the coordinates (100,100). have the following rainfall station coordinates and rainfall as indicated in the table below.

Station	A	B	C	D	E
Coordinates (Km)	(30,80)	(70,100)	(100,140)	(130,100)	(100,70)
Precipitation (mm)	85	135	95	146	102

Using the Theissen polygon determine the average annual catchment precipitation.

QUESTION FIVE (20 Marks)

a) Referring to the watershed illustration 1 with rain-gauges measurements (mm) as indicated, the area of each square is 10 ha. State your assumptions and

(i)   Compute the average precipitation using the isohyetal method

(ii)   Compute the average precipitation using the theissen polygon method.

(12 marks)

b)   Briefly explain the following hydrologic terms:

(i)   Stream stage

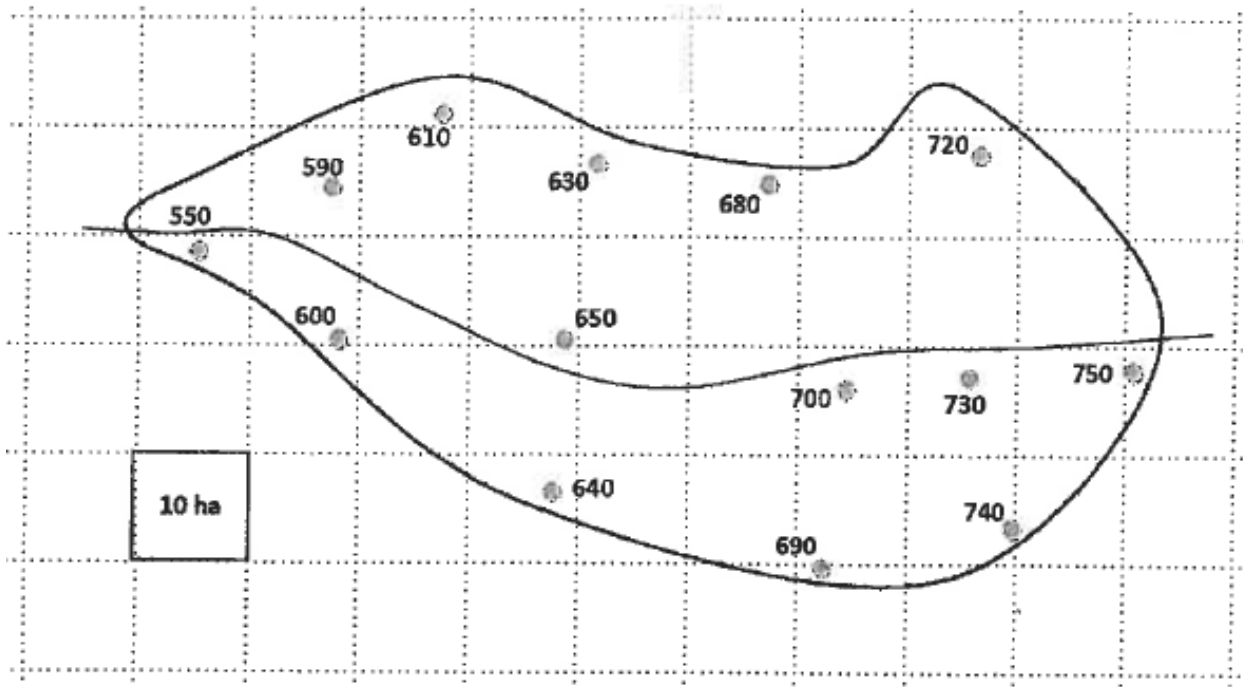(ii)   Rating curve   (8 marks)

Illustration 1: Catchment rainguage distribution