356

UNIVERSITY OF SWAZILAND

DEPARTMENT OF GEORAPHY, ENVIRONMENTAL SCIENCE AND PLANNING

MAIN EXAMINATION: DECEMBER, 2013

B.Sc. I1

TITLE OF PAPER : WATER RESOURCES

COURSE NUMBER : GEP 228

TIME ALLOWED : THREE (3) HOURS

INSTRUCTIONS : ANSWER 2 QUESTIONS FROM EACH SECTION

ILLUSTRATE YOUR ANSWERS WITH APPROPRIATE DIAGRAMS

MARKS ALLOCATED : ALL QUESTIONS CARRY 25 MARKS.

THIS PAPER IS NOT TO BE OPENED UNTIL PERMISSION HAS BEEN GRANTED BY THE INVIGILATOR

SECTION A: ANSWER ANY TWO QUESTIONS (MAIN DEC 2013)

QUESTION 1

(a) Distinguish between weather and climate. (5 marks)
(b) Explain the air masses that influence the weather of southern Africa. (20 marks)
(25 marks)

QUESTION 2

(a) Explain how the climates of Swaziland affect agricultural activities. (10 marks)
(b) Determine the climate of Matsapha, Mbabane and Big Bend given the information in Table 1 and Figure 1 and 2. (15 marks)
(25 marks)

QUESTION 3

(a) Explain the main processes by which heat transfer occurs in the earth-atmosphere system. (10 marks)
(b) Calculate the solar intensity at a place given the following information: solar constant I_o = 1.368kWm^{-2} and solar beam angle, μ = 90°. (15 marks)
(25 marks)

SECTION B: ANSWER ANY TWO QUESTIONS

QUESTION 4

(a) Discuss the role of hydrology in economic development. (10 marks)
(b) Explain one method of estimating the average precipitation of a place and give its advantages over the others. (15 marks)
(25 marks)

QUESTION 5

(a) Describe the importance of hydrological measurements in the sector of water resources. (10 marks)
(b) Table 2 presents the discharge measurements for a hypothetical river. Draw the rating curve and estimate the discharge of the river when the water level is 5.5m. (15 marks)
(25 marks)

40

QUESTION 6

(a) Define unit hydrograph. (5 marks)

(b) Explain the assumptions behind the unit hydrograph theory. (5 marks)

(c) Table 3 presents the ordinates of the total runoff hydrograph for Kizinga River which has a catchment area of 198 km2. Determine the depth of the surface runoff. **(15 marks)**

Table 1 Meteorological information for Matsapha, Mbabane and Big Bend

Matsapha	J	F	M	A	M	J	J	A	S	O	N	D	Avg.
T (°C)	24	23	22	20	18	15	16	17	19	20	21	23	
P (mm)	135	118	109	74	24	20	10	22	65	100	142	115	
Mbabane													
T (°C)	20	20	19	17	15	12	12	14	16	18	19	20	
P (mm)	250	214	174	78	35	18	21	29	64	129	180	216	
Big Bend													
T (°C)	27	26	25	23	19	16	16	18	21	23	4	26	
P (mm)	93	75	63	36	22	12	9	11	30	47	78	88	

Table 2 Discharge measurements for a hypothetical river

Gauge height (m)	Discharge (m^3/s)
0	0
1.25	10.2
1.6	17.1
2.8	49.5
3.5	80.3
4.25	121.3
4.7	186.2
5.0	241.5

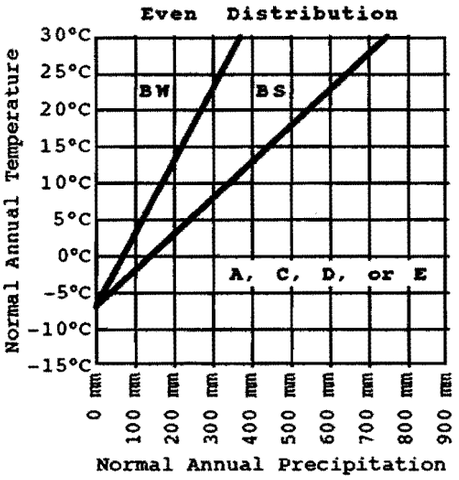
Table 3. Ordinates of the total runoff hydrograph for Kizinga River

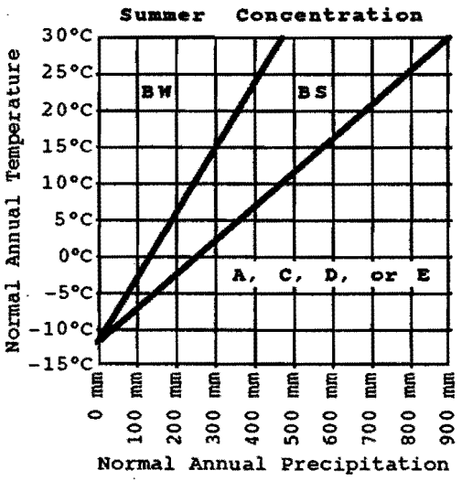
Day	Discharge (m^3/s)
1	0.48
2	0.55
3	0.60
4	1.48
5	1.13
6	0.78
7	0.68
7.5	0.63

FLOW CHART FOR KÖPPEN'S CLIMATE CLASSIFICATION

FIGURE 1

Figure 1: First, divide the year into two six-month seasons: April-September and October-March, representing Summer or Winter in their respective hemispheres.
If 70% or more of the annual precipitation total falls into one of these two seasons, then that season is considered to have a precipitation concentration.
If not, then precipitation is considered to fall evenly throughout the year.





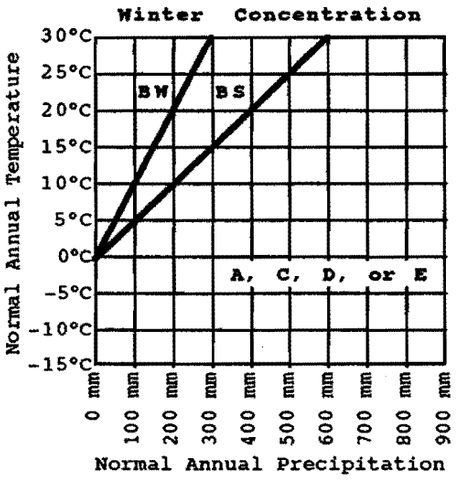
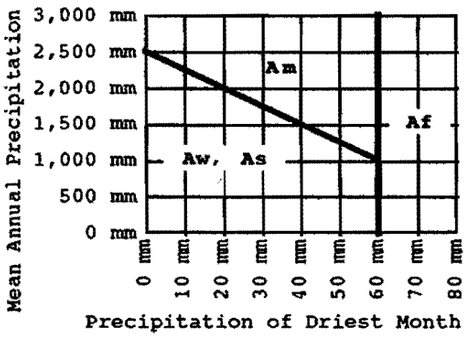


FIGURE 2

Figure 2: First, divide the year into two six-month seasons: April-September and October-March, representing Summer or Winter in their respective hemispheres.
If 70% or more of the annual precipitation total falls into one of these two seasons, then that season is considered to have a precipitation concentration.
If not, then precipitation is considered to fall evenly throughout the year.



FLOW CHART FOR KÖPPEN'S CLIMATE CLASSIFICATION

T and P refer to normal monthly values of Temperature and Precipitation