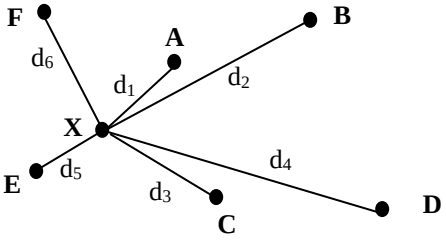
IM 372 Recitation 3

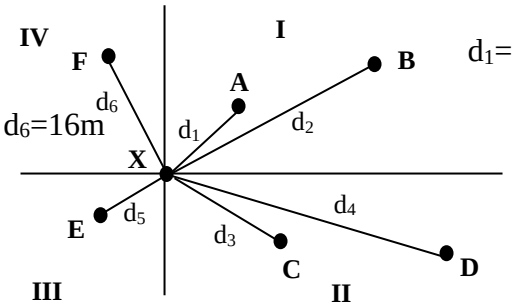


d_1=10 m, d_2=33 m, d_3=14 m, d_4=62 m, d_5=8 m, d_6=16m

(Mc Quen, 1998)

Find the missing precipitation value of X station by using quadrant method. A, B, C, D, E and F stations are near X station and the distances between the stations are shown as d_1, d_2, d_3, d_4,d_5 and d_6 as shown in the figure. Precipitation heights of A, B, C,D,E and F are 3.9 , 1.4 , 3.7 , 1.6 , 2.0 and 0.9 cm respectively.

SOLUTION:



d_1=10 m, d_2=33 m, d_3=14 m, d_4=62 m, d_5=8 m, d_6=16m

The nearest stations are used for the calculations.

Since $d_1 < d_2$ and $d_3 < d_4$; A, C, E and F stations are used. P is calculated according to the formula; $P=\Sigma P_i w_i$ and w_i ratio is:

$$w_i = \frac{\frac{1}{d^2_i}}{\sum_{i=1}^{4} \frac{1}{d^2_i}}$$

Quadrant	Station	P_i (cm)	d_i (m)	d_i^2	w_i	$P_i w_i$
I	A	3,9	10*	100	0,289	1,1271
	B	1,4	33	1089		
II	C	3,7	14*	196	0,147	0,5439
	D	1,6	62	3844		
III	E	2,0	8*	64	0,451	0,902
IV	F	0,9	16*	256	0,113	0,1017
					Σw_i=1,0	$\Sigma P_i w_i$=2,6747

Missing precipitation value of X station is estimated as 2,6747 cm according to quadrant method. d_i is marked with * for the selected nearest stations.

Q2) Potential evapotranspiration (PET)and precipitaiton P values of one watershed is given below. If the maximum humidity of the soil is 120 mm, find the real evapotranspiration and runoff. Accept the soil humidity is zero at the beginning of October.

PET(mm) , P(mm)

Month	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Ag	Sept
PET	55	23	10	5	12	25	50	85	115	125	115	75
P	85	80	83	55	65	70	60	75	75	55	60	63

SOLUTION

Month	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Ag	Sept
PET	55	23	10	5	12	25	50	85	115	125	115	75
P	85	80	83	55	65	70	60	75	75	55	60	63
ΔN	30	57	33	-	-	-	-	-10	-40	-70	-	-
N	30	87	120	120	120	120	120	110	70	0	0	0
RE	55	23	10	5	12	25	50	85	115	125	60	63
R	-	-	40	50	53	45	10	-	-	-	-	-

ΔN: Change of humidity in soil (mm) P:Precipitaiton (mm) PET:Potential evapotranspiration (mm)

N: Humidity amount in soil (mm) RE:Real evapotranspiration (mm) R:Runoff (mm)

If PET<P then Real evapotranspiration is equal to potential evaporation. Excess water from the precipitation infiltrates into soil as soil humidity. When the humidity reachs to its maximum capacity 120mm then after the evapotranspiration, excess water from the precipitation becomes surface water as the runoff.

In spring and summer when PET >P then the precipitation and soil humidity are used for the real evapotranspiration. Real evapotranspiration can be equal or less than the potential evapotranspiration.

Q3) Draw depth-area-duration curves according to the data given below.

	Duration (hour)				
Area (km^2)	**6**	**12**	**24**	**36**	**48**
1000	80,1	120,5	180,4	200,4	260,5
4000	71,2	110,8	160,3	191,2	230,2
10000	58,2	82,6	142,5	180,5	190,4
20000	30,5	63,5	119,2	162,2	170,5
30000	19,4	42,1	97,4	140,4	165,3
35000	10,2	19,4	60,3	110,5	120,6

SOLUTION

According to the data, y-apsis shows precipitation depth and x-apsis shows the area. Curves are drawn for each duration time.