rate at which water maximum

will inter the soil.

***Infiltration Rate***=Ic  If [Ic < i ]

= i If [Ic > i ]

Surface runoff=Rainfall - (Infilitration + Surface retention)

***Infiltration:*** The movement of water through the soil surface in to the soil.

***Infiltration capacity*(IC,mm/hr.):** The ma

Surface retention (Interception + depression Storage)

-------------------------------------------------------------------------------------

**Infiltration Capacity Measurments:**

***1.Infiltrometer:***

Ic=Rate of disappearance of water.

5mm

Ic

t

fo

fa

Ic=fa+(fo-fa)\*e-kt (Horton equ.)

Where:

fo=initial Ic at t=0

fa=final Ic (constant value)

**--------------------------------------------------------------------------**

***2.Infiltration indices:***

**a. The w-Index:**

W=(P-R)/t

**b.The Ф-Index:**the rainfall intensity above which the rainfall volume

equals the runoff volume.

**Example1:** Find the Index of a certain catchment has the change of the rainfall intensity which given below. If the **runoff=33mm**, **P=75mm**

 



**Example2:** A tabulated below are data for a number of storms happened on a river. Compute the W-index for all storms, what would be the av. Error and av. Percentage error in estimated runoff .If the av. W-index was used to compute the runoff?

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Error=Rcomp.-Rob.** | **Rcomp.=P-W\*t** | **W-index**  **(cm/hr.)** | **Rob.**  **(cm)** | **P**  **(cm)** | **Duration,t**  **(hr.)** | **Storm no.** |
| -0.12 | 1.2 | 0.125 | 1.32 | 2.82 | 12 | **1** |
| -1.02 | 0 | 0.041 | 1.02 | 2.98 | 48 | **2** |
| -1.15 | 1.31 | 0.087 | 2.46 | 4.55 | 24 | **3** |
| -2.92 | 4.5 | 0.094 | 7.42 | 14.22 | 72 | **4** |
| 0.01 | 0.44 | 0.136 | 0.43 | 2.87 | 18 | **5** |
| 0.19 | 0.67 | 0.143 | 0.48 | 3.91 | 24 | **6** |
| 1.31 | 3.24 | 0.171 | 1.93 | 8.1 | 36 | **7** |
| 1.12 | 2.79 | 0.228 | 1.67 | 4.41 | 12 | **8** |
| -0.72 | 1.26 | 0.111 | 1.98 | 5.31 | 30 | **9** |
| 1.4 | 4.55 | 0.213 | 3.15 | 6.98 | 18 | **10** |
| ∑=-1.9 | ∑=19.96 | ∑=1.35 | ∑=21.86 |
| Error=-0.19 |  | W=0.135 |

For check:

Av. Error= (∑Rcomp.- ∑Rob.)/10

= (19.96-21.86)/10

=-0.19 ok.

**Example4:**The equation of the **Ic** curve for a certain catchment is given by:

**Ic=1.2+4.2 e-0.33t**

Compute the runoff volume for the following rain storm:

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| 6 | 5 | 4 | 3 | 2 | 1 | **t(hr.)** |
| 3 | 1.4 | 12.2 | 12.8 | 8.5 | 6 | **Rainfall(mm)** |

|  |  |
| --- | --- |
| **Ic** | **t(hr.)** |
| 5.4 | 0 |
| 4.2 | 1 |
| 3.4 | 2 |
| 2.8 | 3 |
| 2.3 | 4 |
| 2 | 5 |
| 1.8 | 6 |

***Solution:*** 

P=(6+8.5+12.8+12.2+6.5+3)

= 49 mm

Depth of the infiltration =∫y dt

=(1.2+4.2 e-0.33t)dt

= 1.2t-(4.2/0.33)e-0.33t]

] \*e-0.33\*0 4.2/0.33) )- =[1.2\*6-(4.2/0.33)\*e-0.33\*6]-[1.2\*0

**= 18.19mm**

R=P-I

=49-18.19

=30.81mm

W-index=(P-R)/t

=18.19/6

=3.032 mm/hr.

To Find The **Ф-Index:**

**R=30.81 mm**

30.81=(12.8-12.2)\*1+(12.2-8.5)\*2+(8.5-6.5)\*3+(6.5-6)\*4+(6- **Ф)**

30.81=16+6\*5-5\* Ф

**Ф**=3.038 mm/hr.

We choose the w-index because it gives larger surface runoff.