WRE ASSIGNMENT- 2

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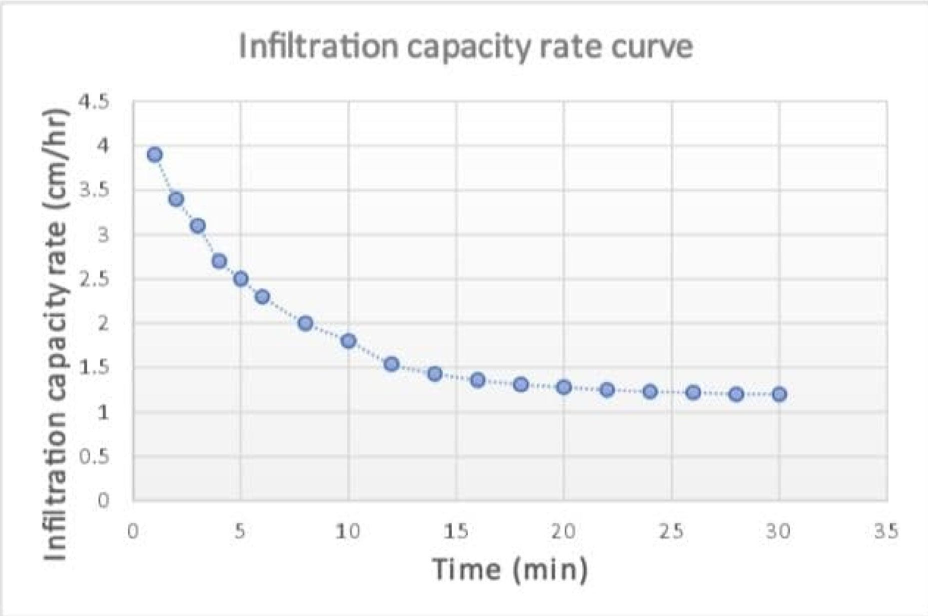
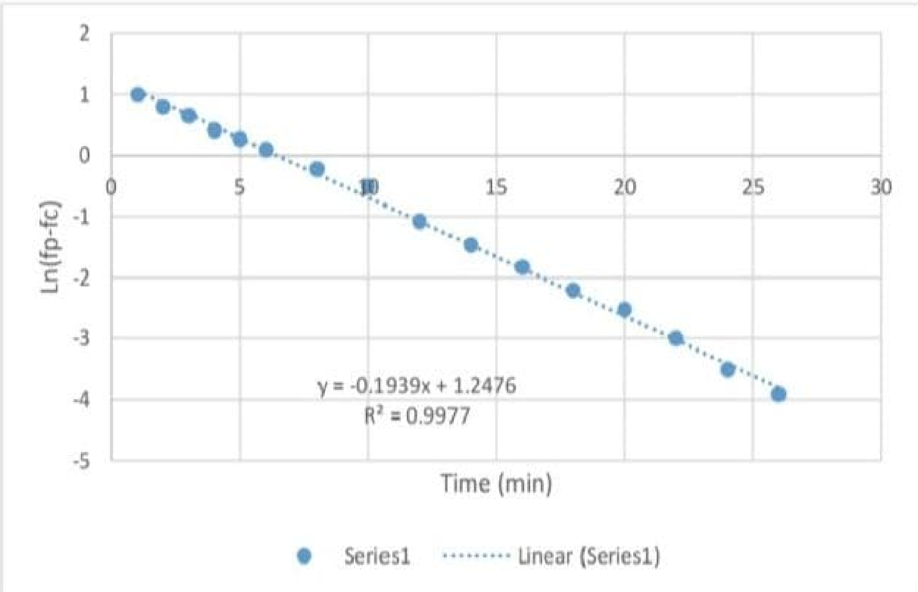
1st solution :

1 (a) – Infiltration capacity curve;



1 (b) – Graph of ln(f_p – f_c) Vs Time



1 (c) –

Time (min)	Precipitation rate (cm/hr)	Infiltration capacity rate (cm/hr)	Excess rainfall rate (cm/hr)	Excess rainfall (mm)	Cumulative excess rainfall (mm)
1	5	3.9	1.1	0.183	0.183
2	5	3.4	1.6	0.2667	0.45
3	5	3.1	1.9	0.3167	0.767
4	5	2.7	2.3	0.383	1.15
5	5	2.5	2.5	0.4167	1.567
6	7.5	2.3	5.2	0.8667	2.43
8	7.5	2	5.5	1.833	4.267
10	7.5	1.8	5.7	1.9	6.167
12	7.5	1.54	5.96	1.986	8.153
14	7.5	1.43	6.07	2.023	10.176
16	2.5	1.36	1.14	0.38	10.556
18	2.5	1.31	1.19	0.3967	10.953
20	2.5	1.28	1.22	0.4067	11.36
22	2.5	1.25	1.25	0.4167	11.776
24	2.5	1.23	1.27	0.423	12.2
26	2.5	1.22	1.28	0.4267	12.626
28	2.5	1.2	1.3	0.433	13.06
30	2.5	1.2	1.3	0.433	13.493

Total excess rainfall = 13.4909mm

4/11/20

WRE ASSIGNMENT - 2.

1(b) From graph;

The equation of line;

$$y = -0.193x + 1.247.$$

$\therefore$ here, the actual Equation is in form of;

$$\ln(f_p - f_c) = \ln(f_0 - f_c) - kt.$$

$$\therefore \ln(f_p - f_c) = 1.247 - 0.193t.$$

$\therefore$ The value of, $k = 0.193.$

$$f_c = 1.2 \text{ cm/hr}$$

$$\therefore f_0 - f_c = (e)^{1.247}$$

$$\therefore f_0 = 4.679 \text{ cm/hr}$$

$$\therefore f_p = 1.2 + 3.4\cancel{79} e^{-0.193t}$$

$$\therefore \boxed{f_p = 1.2 + 3.479 e^{-0.193t}}$$

where; $f_p \to$ in cm/hr.

$t \to$ in minutes.

2^{nd} solution :-

Time (min)	storm rate (cm/hr)	storm rate in increasing order (N=6)	storm rate (N=5)
0-30	1.6	1	
30-60	3.6	1.6	1.6
60-90	5.0	2.2	2.82
90-120	2.8	2.8	2.8
120-150	2.2	3.6	3.6
150-180	1	5	5

$\Rightarrow \frac{16.2-6\phi}{2} = 3.6$ $\quad$ $\Rightarrow \frac{15.2-5\phi}{2} = 3.6$

$\boxed{\phi = 1.5}$ $\quad$ $\Rightarrow \boxed{\phi = 1.6}$

$\therefore$ The value of ϕ-Index $= 1.6$.

3rd solution :-

(i) Form factor : It is defined as the ratio of axial width to the axial length of the basin.

(or)

It is defined as the ratio of water shed area to the square of the length of the water shed.

The values of form factor;

for Elongated basins → < 0.78.

for circular basins → > 0.78

Observations:

1, For $F_r < 0.78$ → Low Peak flows for a longer duration.

2, For $F_r > 0.78$ → High peak flows for shorter duration.

* Form factor represented by 'F_r'.

(ii) Compactness Co-efficient :-

It is defined as the ratio of perimeter of watershed to the circumference of the circle having same area as the water shed. It is represented as C_c.

$$\boxed{C_c = \frac{P_b}{2\sqrt{\pi A}}}$$

(iii) Elongation Ratio:

It is defined as the ratio of diameter of the circle having same area as the basin to the maximum basin length, the values ranges from 0.4 to 1.0. High elongation ratio refers to circular water shed whereas low elongation ratio refers to elongated water shed.

* Elongation ratio represented as 'E_r'.

(iv) Circularity ratio:

It is defined as the ratio of ~~diameter~~ the basin area to the area of circle having same perimeter as the basin.

↳ The values ranges from 0.2 to 0.8.

↳ It is represented as C_r.

↳ Low C_r value refers to no structural disturbance and high C_r values refers to existence of strong structural contribution on the water shed.

Formula of C_r; $\boxed{C_r = \frac{4\pi A_b}{P_b^2}}$

(v) Given; $A_b = 26560\ km^2$.

$P_b = 965\ km$.

$L_b = 230\ km$. , $W_b = 115.5\ km$.

∴ a) Form factor $(F_r) = \frac{115.5}{230} = \underline{\underline{0.502}}$.

b) Compactness Co-efficient $= \frac{965}{2\sqrt{\pi A}} = \frac{965}{2\sqrt{3.14 \times 26560}}$

∴ $\boxed{C_c = 1.67}$

c) Elongation Ratio;

$$E_r = \frac{2 \times \sqrt{\frac{26560}{3.14}}}{230}$$

∴ $\boxed{E_r = 0.8}$

d) Circularity ratio;

$$C_r = \frac{26560 \times 4 \times 3.14}{(965)^2} = 0.3582.$$

$\therefore$ $\boxed{C_r = 0.3582}$.

4th solution:-

Given, Land Use (% area);

Hard surface = 10%, waste land = 5%,

orchard = 30%, Cultivated, poor (terraced) condition = 55%

$\therefore$ under Group-B $\rightarrow$ 60% Area.

under Group-C $\rightarrow$ 40% Area.

AMC II., $I_a = 0.25$.

given $P = 125$ mm;

Curve Number $\rightarrow$ Hard surface $= (0.6 \times 86) + (0.4 \times 91)$

$= 88.$

waste land $= (0.6 \times 80) + (0.4 \times 85)$

$= 82.$

orchard $= (0.6 \times 53) + (0.4 \times 67)$.

$= 58.6$

Cultivated land (terraced & poor condition) $= (0.6 \times 74) + (0.4 \times 80)$

$= 76.4.$

∴ Weighted Curve Number;

$$= (0.1 \times 88) + (0.05 \times 82) + (0.3 \times 58.6) + (0.55 \times 78.4)$$

$$= 72.5$$

$$\therefore S = \left(\frac{1000}{72.5} - 10\right) \times 2.54$$

$$\therefore \boxed{S = 9.634 \text{ cm.}} \text{ (or) } \boxed{S = 96.34 \text{ mm.}}$$

$$\therefore \cancel{R = \frac{(P - 0.25)^2}{P + 0.85}}$$

$$\therefore R = \frac{(P - 0.2S)^2}{(P + 0.8S)} = \frac{(125 - 0.2 \times 96.34)^2}{(125 + 0.8 \times 96.34)}$$

$$\therefore \boxed{R = 55.323 \text{ mm}}$$

By,

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