\Assignment 2: Applications of Python in the field of Hydrology

DATE :

1. **The infiltration capacity of soil in a small watershed is found to be 6cm/hr before rainfall event. It was found to be 1.2 cm/hr at the end of8 hours storm. If the decay coefficient is 0.888 /hour, Find the total infiltration during these 8 hours by using Horton's equation.**
2. **For a drainage basin of 640 km, isohytals based on a storm event yield the following data: calculate the mean precipitation.**

|  |  |
| --- | --- |
| **Isohyets interval**  **(cm)** | **Inter-Isohytal 10**  **Area (km')** |
| **14-12** | **90** |
| **12-10** | **140** |
| **10-8** | **125** |
| **8-6** | **140** |
| **6-4** | **85** |
| **4-2** | **40** |
| **2-0** | **20** |

**The recorded annual rainfall from 5 rain gauge stations in a catchment and the corresponding Theissen polygon area as follows**

|  |  |  |
| --- | --- | --- |
| **Polygon area (cm^2)** |  | **P (cm)** |
| **25** |  | **125** |
| **30** |  | **175** |
| **30** |  | **225** |
| **10** |  | **275** |
| **5** |  | **325** |

**If the scale of the map is 1:50000 estimate the volume and the mean depth of rainfall**

Q.1

1. **# Calculation of total Infiltration by Horton's Equation**
2. **fo = float(input("Enter the value of initial Infiltration Rate:"))**
3. **fc= float (input("Enter the value of Final infiltration Rate:"))**
4. **t= int(input("Enter the value of Time:"))**
5. **kh= float(input("Enter the value of Decay Coefficient:"))**
6. **# The total Infiltration is given by:**
7. **Fp= fc\*t+ (fo -fc)/kh # replacing ' with \* for multiplication**
8. **print ("The value of Total Infiltration is:", Fp) Output :**

Enter the value of initial Infiltration Rate:6 Enter the value of Final infiltration Rate:1.2 Enter the value of Time:8

Enter the value of Decay Coefficient:0.888

The value of Total Infiltration is: 15.005405405405405

Q.2

1. **# Calculation of Mean precipitation by theissen's polygon Method**
2. **# The value of precipitation at Each station is**
3. **p1=int(input("Enter the value of rainfall at Station 1: "))**
4. **p2= int(input("Enter the value of rainfall at Station 2:"))**
5. **p3 =int(input("Enter the value of rainfall at Station 3:"))**
6. **p4 =int(input("Enter the value of rainfall at Station 4:"))**
7. **p5 =int(input("Enter the value of rainfall at Station 5:"))**
8. **#Area for each station**
9. **A1= int(input("Enter the value of Catchment Area for raingauge station 1:"))**
10. **A2= int(input("Enter the value of Catchment Area for raingauge station 2:"))**
11. **A3 =int(input("Enter the value of Catchment Area for raingauge station 3:"))**
12. **A4=int(input("Enter the value of Catchment Area for raingauge station 4:"))**
13. **A5= int(input("Enter the value of Catchment Area for raingauge station 5:"))**
14. **#The total catchment area is 15. A=A1 + A2 + A3 + A4+ A5**
15. **print ("The value of Total Catchment area is:", A)**
16. **# Runoff Volume**
17. **# The volume shall be multiplied by the coefficient 2500 to cater scale effects**
18. **#Runoff Volume**

20. V= (p1\* A1 + p2\* A2+ p3\* A3+ p4 \*A4+p5\* A5)\*2500 # Changed Al to A1

1. **print ("The runoff volume from the given catchment is:", V)**
2. **# Mean Precipitation**

23. p = (p1 \* A1+ p2 \* A2 + p3 \* A3+ p4 \* A4+ p5 \* A5)/A

24. print ("The value of Mean Precipitalon is:", p) Output :

Enter the value of rainfall at Station 1: 125 Enter the value of rainfall at Station 2:175 Enter the value of rainfall at Station 3:225 Enter the value of rainfall at Station 4:275 Enter the value of rainfall at Station 5:325

Enter the value of Catchment Area for raingauge station 1:25 Enter the value of Catchment Area for raingauge station 2:30 Enter the value of Catchment Area for raingauge station 3:30 Enter the value of Catchment Area for raingauge station 4:10 Enter the value of Catchment Area for raingauge station 5:5 The value of Total Catchment area is: 100

The runoff volume from the given catchment is: 48750000 The value of Mean Precipitalon is: 195.0

Q.3

1. **#Calculation of Mean precipitation by Isohytel Method**
2. **#The value of precipitation at Each station i**
3. **p1=int(input("Enter the value of rainfall at Station 1:"))**
4. **p2= int(input("Enter the value of rainfall at Station 2:"))**
5. **p3=int(input("Enter the value of rainfall at Station 3:"))**
6. **p4=int(input("Enter the value of rainfall at Station 4:"))**
7. **p5= int(input("Enter the value of rainfall at Station 5:"))**
8. **p6=int(input("Enter the value of rainfall at Station 6:"))**
9. **p7=int(input("Enter the value of rainfall at Station 7:")) # Changed Int to int**
10. **p8=int(input("Enter the value of rainfall at Station 8:"))**
11. **# Area for each station**
12. **A1= int(input("Enter the value of Catchment Area for raingage station 1:"))**
13. **A2= int(input("Enter the value of Catchment Area for raingage station 2:"))**
14. **A3= int(input("Enter the value of Catchment Area for raingage station 3:"))**
15. **A4=int(input("Enter the value of Catchnent Area for reingauge station 4:"))**
16. **A5= int(input(" Enter the value of Catchment Ares for raingauge station 5:"))**
17. **A6= int(input("Enter the value of Catchment Area for raingeuge station 6:")) # Changed Int to int**
18. **A7= int (input("Enter the value of Catchment Area for reingauge station 7:"))**
19. **# The total catchment area is**

20. A = A1 + A2 + A3 + A4 + A5 + A6 + A7

1. **print ("The value of Total Catchment ar ea is :", 4)**
2. **# Mean Precipitation**

23. p = ((p1 + p2) \* A1 / 2 + (p2 + p3) \* A2 / 2 + (p3 - p4) \* A3 / 2 + (p4 + p5) \* A4 / 2 + (p5 + p6) \* A5 / 2 + (p6 + p7) \* A6 / 2 + (p7 + p8) \* A7 / 2) / A

24. print ("the value of Mean Precipitalon is:", p)

Output :