Nov 14, 2013
Written examination exercises,
Course "*Forest Hydrology" and "Forest and Hillslope Hydrology*"

Problem 1

For a catchment 50 km^2 wide you need to compute the runoff depth following a storm with duration of 3 hours and depth of 90.0 mm. The catchment is characterised by an overall CN equal to 60, Ia=0.05 Smax.

Compute

1. *the runoff depth in mm ;*
2. *the runoff coefficient.* .

Results:

1. runoff depth: *mm*

2. runoff coefficient:

Problem 2

Rainfall in a catchment 50 km^2 wide is monitored by a network of 3 stations, for which the point rainfall during a flood is:

Station 1: 200 mm

Station 2: 200 mm

Station 3: 80 mm

Use the Thiessen method to compute the event basin averaged rainfall. The Thiessen weights are as follows:

Station 1: 0.25

Station 2: 0.25

Station 3: 0.50

The catchment is characterised by an overall CN equal to 60, Ia=0.04 Smax.

Compute

1. *the runoff depth in mm ;*
2. *the runoff depth in m^3;*
3. *the runoff coefficient.* .

Answers

Thiessen

Areal mean precipitation: *mm*

Runoff depth: *mm*

Runoff ratio: *(-)*

Problem 3

Repeat the computation of Problem 2 by considering the stations equally representative, and compute the corresponding runoff depth and runoff coefficient. Discuss the results you have obtained.

Discussion on the differences

Answers

Arithmetic average

Areal mean precipitation:	*mm*
Runoff depth:	*mm*
Runoff ratio:	*(-)*

Problem 4

An artificial reservoir is fed by a 200 km^2 wide catchment. During a flood event, the runoff to the reservoir during the i^{th} hour was 10 mm. During the same hour, the volume of water in the artificial reservoir increased of 1.815 10^6 m^3. Compute the mean discharge from the artificial reservoir during the i^{th} hour, assuming that the losses due to evapotranspiration and internal storages are negligible (please, comment this assumption).

Results:

Mean discharge: m^3/s

Problem 5

Consider a flood event in a catchment 50 km^2 wide. Mean areal rainfall cumulated over the event is equal to 350 mm; the runoff volume is equal to 180 mm. Considering a value for Ia equal to 0.1 S, please compute the maximum volume of water that can be stored in the soil (S). Based on the value of S, compute the value of CN.

Results:

1. S:	*mm*
2. CN:	

Problem 6

Consider the Problem 5, and compute the value of runoff depth for a CN value increased by 10% and decreased by 10%.

Results:

1.Runoff volume (CN+10%):	*mm*
2. Runoff volume (CN-10%):	*mm*

Problem 7

A mean annual discharge value of 0.6m^3s^{-1} has been recorded at the outlet of a 20 km^2 wide catchment. The annual total precipitation over the catchment is 1500 mm. Compute the evapotraspitation loss (in mm), assuming that the internal storage changes are negligible.

<u>Results:</u>
Evapotranspiration depth: mm

Problem 8

The mean annual precipitation over a 150 km^2 wide catchment is 1300 mm. The potential evapotranspiration loss is 550mm whereas the real evapotranspiration loss is 300mm. Compute the mean annual runoff coefficient and the discharge values (m^3/s), assuming that the internal storage changes are negligible.

<u>Results:</u>
Runoff coefficient:
Mean annual discharge: m^3/s

Problem 9

Calculate the daily evapotranspiration from a forest in the Alps if R_n = 200Wm^{-2}; G and H are negligible, and the temperature is approximately constant.

<u>Results:</u>
Daily evapotranspiration: mm

Problem 10

The mean annual precipitation over a 150 km^2 wide catchment is 1300 mm. The potential evapotranspiration loss is 550mm whereas the real evapotranspiration loss is 300mm. Plot the catchment on the Budyko diagram and describe the expected vegetation.

<u>Results:</u>
Plot (drawing)
Vegetation: