

KATHMANDU UNIVERSITY
End Semester Examination
March/April, 2017

Marks Scored:

Level : B.E.

Year : IV

Exam Roll No :

Time: 30 mins

Course : GEOM 409

Semester: I

F.M. : 10

Registration No.:

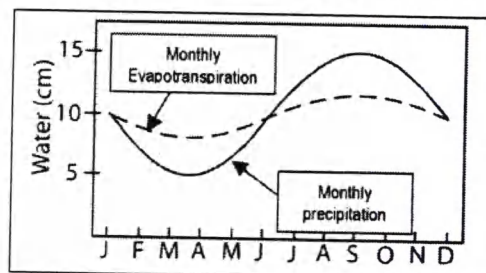
Date : APR 07 2017

SECTION "A"

[20 Q. \times 0.5=10 marks]

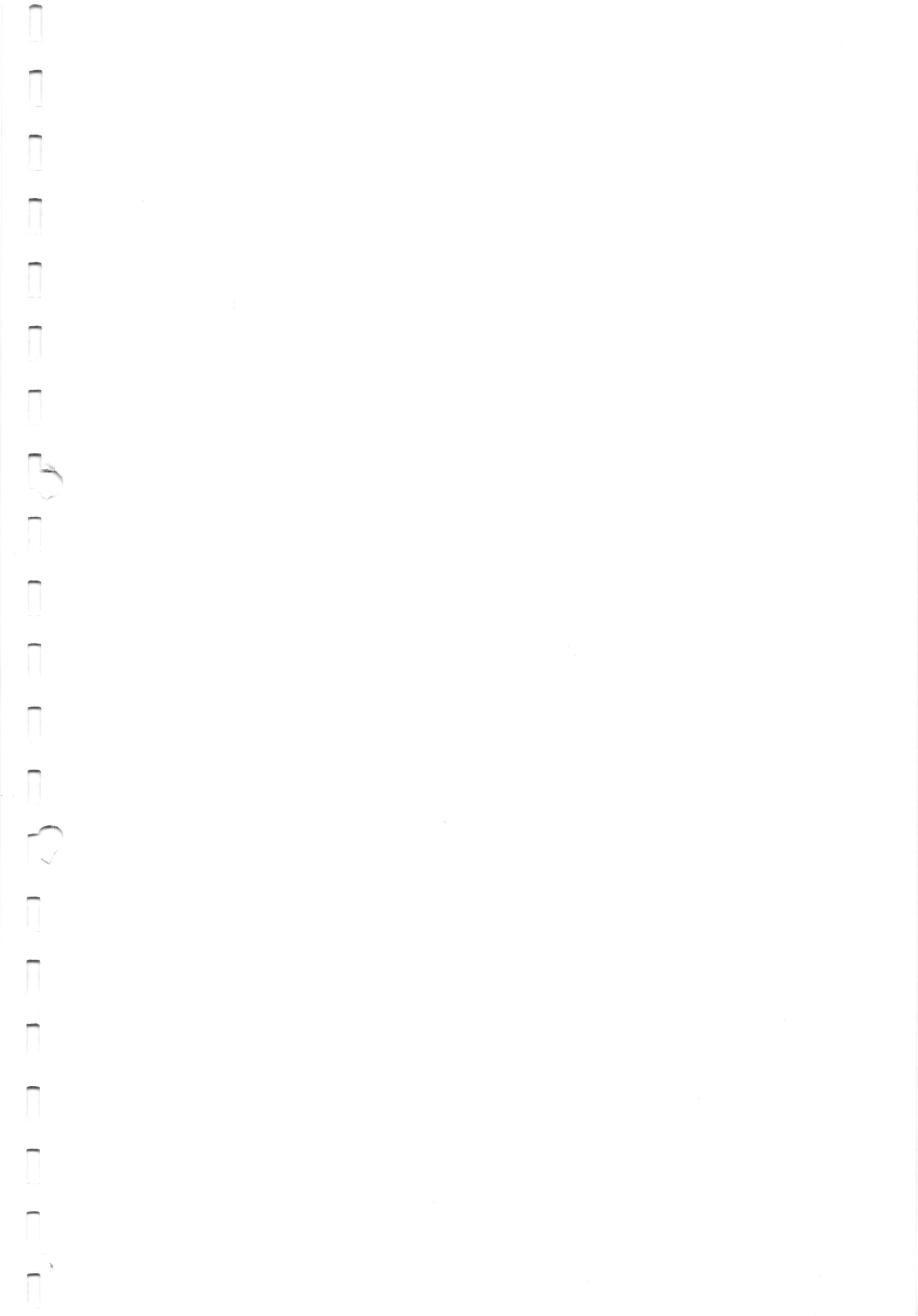
Tick the most appropriate answer from the given alternatives.

1. A watershed is a natural unit which essentially represents the water contributing area _____.
a. downstream of the outlet
b. upstream of the outlet
c. adjacent to a political boundary
d. of an irrigation scheme
2. A watershed divide outlines the:
a. Ridge
b. Stream network
c. Outlets
d. Valleys
3. A watershed has three distinct precipitation zones: Zone A receives 1200mm, Zone B receives 1500mm and Zone 3 receives 600mm, in the monsoon season. Considering the respective areas of Zones 1, 2 and 3 as 250km², 275km² and 475km², calculate the average monsoon precipitation of the watershed.
a. 9975mm
b. 1200mm
c. 99.75cm
d. 1500mm
4. A watershed has a characteristic runoff-rainfall ratio of 0.3 for a rainfall event of 50mm. Assuming the ratio to be constant for a period of 5 hrs, calculate the average runoff rate during the event at the outlet. The area of the watershed is 300ha.
a. 1.667m³/s
b. 2.5m³/s
c. 9900m³/hr
d. 1.87m³/s
5. A precipitation event occurring at an intensity of 25mm/hr for a duration of 5 hrs, produces a direct runoff volume of 50000 m³ from a catchment of 100ha area. The precipitation NOT available for runoff for the event would be:
a. 75cm
b. 7.5mm
c. 750mm
d. 75mm
6. The accompanying chart shows the weather pattern of a catchment. Based on it, which of the following statements is FALSE?
a. The soil is drying out between June and December.
b. The greatest rainfall occurs in September.
c. The soil is drying out between January and June.
d. In June, precipitation equals evapotranspiration.
7. A Digital Elevation Model needs to be hydrologically correct _____.
a. to add peaks and sinks
b. to create an artificial channel
c. to obtain a continuous flow direction network
d. to assess the landuse and soil characteristics of a catchment



APR 07 2017

18. Calculate the runoff for an area receiving 8cm of rainfall for a day. Use the standard SCS-CN method assuming a CN value of 82.
- a. 4.3cm b. 38mm c. 38cm d. 43mm
19. Increasing the threshold drainage area during watershed delineation process in SWAT would _____ the stream network.
- a. increase b. not change c. delete d. decrease
20. Hydrologic Response Units (HRUs) are unique combinations of _____.
- a. land use, soil and slope b. land use, slope and AMC
c. soil and slope d. land use and soil



KATHMANDU UNIVERSITY
End Semester Examination
March/April, 2017

APR 07 2017

Level : B.E.
Year : IV
Time : 2 hrs. 30 mins.

Course : GEOM 409
Semester: I
F.M. : 40

SECTION "B"

[6 Q. × 4=24 marks]

Attempt ANY SIX questions.

1. Define a system and a model. What are their components? Explain both model and system using suitable examples and figures. [2+2]
2. Why are models used when there is an actual system available? Explain each with suitable examples of model application. [4]
3. Define a watershed. What are the functions of a watershed? Draw a flowchart for the watershed delineation process used in ArcGIS. [1+1+2]
4. What is a hydrological model? What does it simulate? Differentiate between "lumped" and "distributed" hydrologic models. [1+1+2]
5. How the performance of a model is normally evaluated? Define the following three distinct periods adopted during modeling: [1+1+1+1]
 - a. Warm-up period
 - b. Calibration period
 - c. Validation period
6. Define infiltration and surface runoff. Calculate the peak runoff rate at the outlet of a catchment with an area of 20ha, following a rainfall event of 20cm over 10hrs. Assume the runoff coefficient to be 0.3. [2+2]
7. Rainfall recorded within the first 3 days of June in a 500 ha watershed is given in the table below. The antecedent moisture condition (AMC) for the first day is assessed to be under Category I. [3+1]

Dates	June 1	June 2	June 3
Rainfall (mm)	50	35	28

- a. Assuming a CN-I value of 55.2 and using the standard SCS-CN method, calculate the 24 hour runoff rates **for each of the given dates.**
 - b. If the CN-I value was 82, what would be the runoff rate for **June 3?**
8. Differentiate between ANY TWO of the following: [2+2]
- a. Automatic and Manual Calibration
 - b. Potential and Actual Evapotranspiration
 - c. Infiltration rate and Infiltration capacity

SECTION "C"

[2 Q. × 8=16 marks]

Attempt ANY TWO questions.

9. What is a hydrograph? Sketch a flood hydrograph and explain its different components. What are the factors that can affect the shape of a hydrograph? Briefly elaborate each of them. [1+4+3]

10. A 5000ha catchment has the soil and landuse characteristics as shown in the tables below:

Soil Type	Area	Hydrologic group
Sandy	1250 ha	A
Clay loam	3750 ha	C

Landuse	Area	Curve Number (CN-II) for average moisture conditions	
		Soil Group 'A'	Soil Group 'C'
Forest Area	1000 ha	32	70
Agriculture Area	2500 ha	65	82
Barren Area	1100 ha	49	79
Urban Area	400 ha	89	94

The observed Antecedent Moisture Condition (AMC) showed that the total rainfall in the previous 5 days was 55mm. The season is a **Growing Season**.

- a. Based on the information given above, calculate the runoff volume for the catchment from a 24hr rainfall event of 200mm.
 - b. If the rainfall in the previous 5 days was 30 mm, what would be the runoff volume for the same 200mm of rainfall? [4+4]
11. Briefly explain the various phases of model evaluation. Show the phases using a flow chart. Also, explain the four criteria used for model selection. [4+4]

OR

Briefly explain the Soil and Water Assessment Tool (SWAT). Describe the process to setup a SWAT model. [3+5]