UNIVERSITY OF COLOMBO, SRI LANKA

FACULTY OF ARTS

THIRD YEAR END EXAMINATION IN ARTS (ONLINE), SEMESTER I – 2020/2021

GYG 3149 - Hydrology

Instructions to Students:

- The question paper starts on page 2.
- All written assessments must be **handwritten**. Handwriting must be **clear and readable**.
- Answers should be written on an **A4 size paper** (ruled/lined paper/or otherwise), using **a black ball point pen.**
- The **index number must be written on the top right-hand side** of each page of the answer script. Do not write your name anywhere on the answer script.
- **Number the pages** of the answer script using the following format at the **bottom of the page**: E.g., if it consists of 5 pages 1/5, 2/5…etc.
- Use the **common front page** (provided on LMS) as the first page of the answer script. You may print, or hand write the front page which must be the first page of your assessment.
- The **total number of pages** should be indicated on the front page of the answer script.
- **Scan/take photos of the answer script and convert it to a single PDF file** in the order of the page numbers.
- The full page of the answer script must be properly covered in the scanned image, and the scanned image must be clear/readable.
- LMS does not permit individual pages to be uploaded separately.
- **The only acceptable file format is PDF. The PDF file should be named with your index number**, e.g. A 12345
- Uploading answer scripts as JPEG/JPG or any other form will not be permitted.
- Complete and upload the final version of the answer script to LMS **within the stipulated 5 hours**
- Once the answer script has been uploaded to LMS, take **a screen shot of the full page** of the LMS with the word 'submitted', as an acknowledgement and keep it with you.
- **If** there is an **unexpected technical issue** with the uploading of an answer script to LMS, you may send your answer script via email to **exam3@arts.cmb.ac.lk** immediately.

UNIVERSITY OF COLOMBO, SRI LANKA

FACULTY OF ARTS

THIRD YEAR EXAMINATION IN ARTS (ONLINE) SEMESTER I – 2020/2021

Hydrology – GYG 3149

Duration: **5 hours** for completion and submission of answer scripts to LMS.

Answer only 03 questions **including Question 05**.

Question 01

1. What is hydrology?

(02 marks)

2. What is the importance of studying hydrology?

(04 marks

3. "Ancient Sri Lankan people were experts on water management." Explain briefly.

(06 marks)

4. Explain the need of water management for a country like Sri Lanka in the present day with suitable examples.

(08 marks)

Question 02

1. Explain the hydrological cycle using only a diagram

(02 marks)

2. What are the properties of water?

(04 marks)

3. "The dynamic nature of hydrological cycle depends on solar energy." Explain briefly.

(06 marks)

4. ."Recharging of aquifers depends on the land use pattern of the particular drainage basin." Explain your reasons.

(08 marks)

Question 03

1. What are the instruments that could be are used for studying experimentally of the different components of the hydrological cycle?

(02 marks)

2. What is meant by hydrological basin?

(04 marks)

3. Name the drainage patterns of a drainage basin and briefly explain them.

(06 marks)

4. Calculate the followings, using the given table,

   I. Drainage density (for the entire drainage basin)

   II. Stream Length ratio for each stream order

   III. Bifurcation ratio for each stream order

Stream order	Drainage units	Average length of a unit /km	Average area of a unit /Km^2
1	160	6	2
2	80	12	6
3	40	35	30
4	20	62	40
5	1	300	120

(08 marks)

Question 04

1. Categorize drainage basins according to the area.

(02 marks)

2. What are the two main components used to describe a drainage basin?

(04 marks)

3. Calculate the Drainage Area ratio by using the following table.

Stream Order	Number of Drainage Units	Unit Area /km^2
1	220	110
2	160	640
3	120	1200
4	105	2520
5	80	3360
6	68	4080
7	45	3240
8	32	2880
9	20	2200
10	1	320

(06 marks)

4. Categorize the shape of drainage basins according to the Elongation ratio and calculate the Elongation ratio for each drainage basins based on the following table.

(08 marks)

Drainage basin	Area /km^2	Maximum length of drainage basin/km
A	1500	54
B	800	42
C	1600	86
D	2300	65
E	3200	70

Question 05

1. Sate the ways of receiving rains for Sri Lanka.

(02 marks)

2. How is Sri Lanka zoned with regards to the rainfall?

(04 marks)

3. Briefly explain the factors deciding the amount of water flowing into Sri Lankan river systems. If the annual rainfall received by Sri Lanka is 2400 mm, calculate the amount of annual discharge of water to the ocean. (Area of Sri Lanka is 65610 km. Annual evaporation is 10% and annual infiltration is 35%)

(06 marks)

4. The table given below shows the rainfall data collected from 1990 to 2000 at several stations of Sri Lanka. Using the table answer to the following questions.

Station	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Rathnapura	3500	3630	1560	3200	3450	3600	1420	2900	3300	3650	3610
Nuwaraeliya	2100	2220	1200	2150	2300	2140	1100	2300	2200	2150	2240
Kandy	2450	2340	1830	2300	2500	2360	1680	2350	2350	2360	2410
Galle	3400	3560	2300	3250	3200	3350	2200	3350	3560	3450	3510
Ampara	1700	1605	940	1550	1670	1590	890	1820	1450	1760	1720
Badulla	1650	1450	830	1430	1540	1630	760	1690	1560	1610	1630
Matale	1820	1720	780	1540	1600	1780	810	1910	1780	1740	1810
Dambulla	1430	1370	670	1320	1250	1410	730	1520	1340	1480	1440
Anuradhapura	1220	1300	560	1190	1150	1240	610	1310	1300	1250	1230
X	720	800	400	760	830	780	420	780	760	780	790

I. Calculate the average rainfall values of each stations and show them in a bar graph.

II. Plot cumulative average annual rainfalls of the stations of Rathnapura and X from 1990 to 2000 in a same graph.

III. In which climatic zone is the station X located?

IV. Indicate the year/s of low rainfall and give the reasons.

V. In which year such a decrease could be expected in the future?

(08 marks)

Question 06

1. What are the properties of a drainage basin?

(02 marks)

2. State what are the morphometric analysis and categorize the types of analysis?

(04 marks)

3. Briefly discuss how geological structures, soil and land use patterns could be used for the drainage basin management of a drainage basin.

(06 marks)

4. The table below shows the hourly volume of water flowing for 24 hours measured at a water gauge station of a stream. Solve the problems given below.

1. Draw a hydrograph by plotting the volume of water against the time.
2. What is the total volume of water flowed during this time period?
3. How many spells of rain were received by the relevant drainage basin?
4. What is the time period taken to reach the water to this station after the after the first spell of rain?
5. What is the base flow of the stream?

Time/hour	Volume of water/m^3
1	2.6
2	3
3	12
4	25
5	45
6	80
7	115
8	145
9	90
10	50
11	35
12	45
13	60
14	75
15	90
16	110
17	135
18	160
19	185
20	170
21	125
22	75
23	15
24	3

(08 marks)

----------//----------