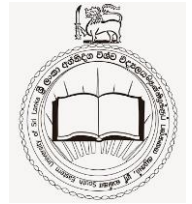


**Bachelor of Biosystems Technology  
Faculty of Technology  
South Eastern University of Sri Lanka**

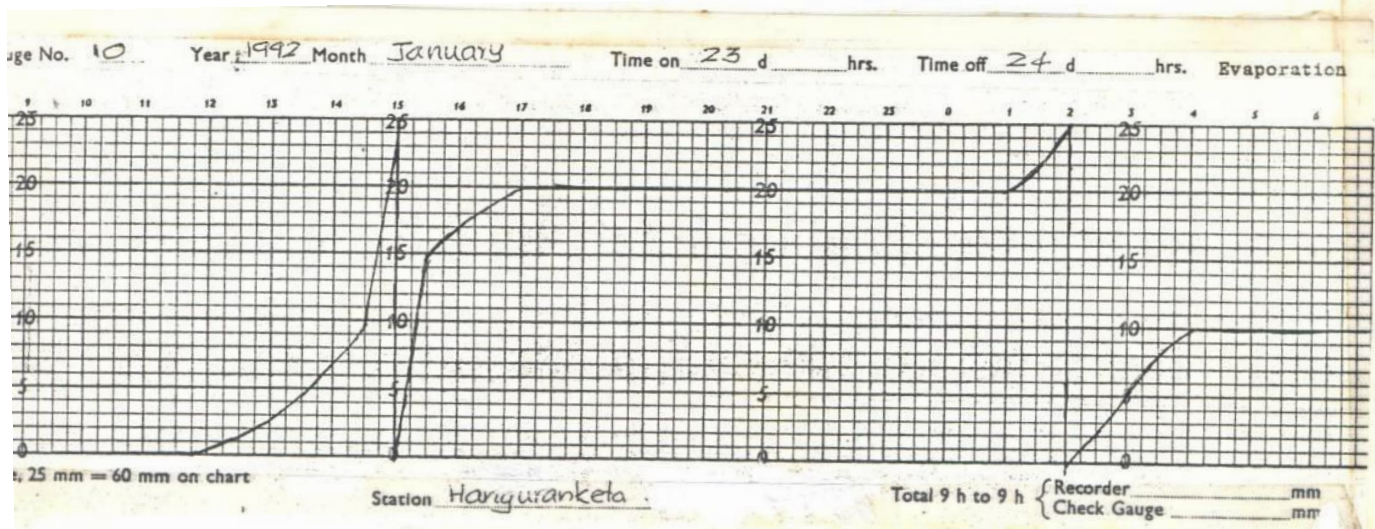


**BSE 11022 – Hydrology and Meteorology**

Assignment 1

Professor M.M.M. Najim

1. Given recording rain gauge chart shows a rainfall event over a small tank catchment in Sri Lanka.



- a) Find the total amount of rainfall
  - b) Find the maximum rainfall intensity, time at which it occurred and its duration.
  - c) The tank has a water surface area of 20 ha, a catchment area of (excluding water surface area) 5 km<sup>2</sup>. If the water level was raised by 0.45 meters due to this rainfall event, calculate the fraction of rainfall that contributed to the runoff (neglect increase in water surface area with increasing volume for the reservoir and other losses)
  - d) As a student of hydrology, what does this fraction signify in terms of simple rainfall runoff relations?
2. Precipitation station X was inappropriate for part of a month during which storm has occurred. The respective precipitation totals of three surrounding stations A, B, and C were 98, 80 and 110 mm. The normal annual precipitation amounts at stations X, A, B, and C are 880, 1008, 842, and 1080 mm. Estimate the missing storm precipitation from station X.

3. Calculate the average annual rainfall amounts for stations A, B, C and D.

Year	A	B	C	D	X
1990	6.6	8.9	8.7	9.8	8.8
1991	5.5	5.7	5.6	5.0	5.6
1992	9.6	9.7	9.7	9.0	10.0
1993	14.9	16.9	16.6	16.7	16.7
1994	22.8	18.0	23.9	21.6	20.5
1995	21.4	22.7	21.7	23.0	23.4
1996	18.1	17.1	16.7	15.6	17.9
1997	18.6	17.9	16.9	18.5	16.8
1998	16.7	18.1	17.1	17.1	16.4
1999	19.3	18.7	17.9	20.3	19.3

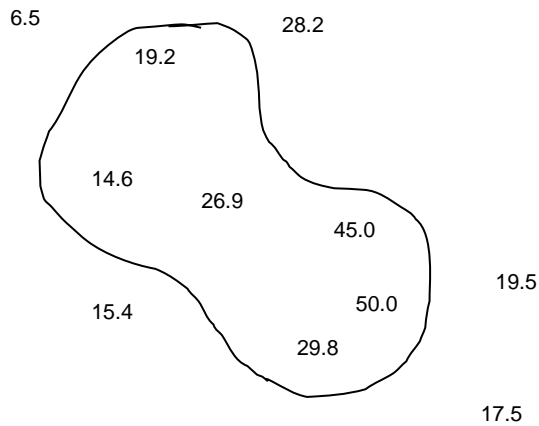
By assuming that stations A, B, C and D are closely located, estimate the missing rainfall of station X for the months of April 2000.

2000	A	B	C	D	X
April	4.5	3.2	1.2	0.5	?

4. The precipitation falling on a Catchment area of 50 km<sup>2</sup> is sampled by six rain gauges. From the measurements in table, estimate the aerial rainfall for 2001. If a dam is built at the catchment outfall and a minimum discharge of 0.1 m<sup>3</sup>/s is maintained throughout the year in the river downstream, estimate the volume of water available for supply from the reservoir. Assume the catchment is water tight and there is a total evaporation loss of 400 mm.

Rain Gauge	2001 Rainfall (mm)	Thiessen Polygon Area (km <sup>2</sup> )
1	2052	7.8
2	1915	8.3
3	1868	10.2
4	1723	11.5
5	1640	5.4
6	1510	6.8

5. A watershed area and the surrounding rain gauge readings are given in the Figure below. The rainfall is measured in millimeters.



- Calculate the average rainfall by arithmetic mean method.
- Thiessen polygon areas for the above watershed are as follows. Calculate the average rainfall.

Observed rainfall (mm)	Area (km <sup>2</sup> )*
6.5	7
14.6	120
19.2	109
26.9	120
15.4	20
29.8	92
50.0	82
45.0	76

\* area given is the area corresponding polygon within basin boundary

- Following table gives the areas enclosed by different isohyets. Calculate the average rainfall.

Isohyets (mm)	Area enclosed** (km <sup>2</sup> )
50	13
40	90
30	206
20	402
10	595
< 10	626

\*\* Within watershed boundary

6. Find the areal precipitation by arithmetic mean, Thiessen polygon and Isohyetal methods for the area given and comment on the difference if any.

