Uva Wellassa University of Sri Lanka
Faculty of Science and Technology
Department of Science and Technology
300 Level 1st Semester Examination – June/July 2017

Uva Wellassa University

MRT 373-2 Hydrology

Instructions to candidates
Duration: Two (02) hours
Number of questions: Four (04)
Answer all questions
Mark allocation: 100

1.

a. What is meant by the time of concentration of a watershed? (03 mark)
b. What is the unit hydrograph? (03 mark)
c. The observed outflows in a stream from a watershed of 1.08 km^2 due to a storm of 3-hour duration are given in the table.

Time	2 a.m.	3 a.m.	4 a.m.	5 a.m.	6 a.m.	7 a.m.	8 a.m.
Flow (m^3/hour)	16	32	53	76	60	39	16

i. Determine the equivalent depth of direct runoff. (03 mark)
ii. Derive the 3-hour unit hydrograph. (03 mark)
iii. What will be the outflow hydrograph for 2-hour storms of 14 mm and 6 mm started at 3 a.m. and 6 a.m. respectively? (27 mark)
iv. Derive the 4-hour unit hydrograph using lagging storm method. (05 mark)
(State the assumptions you made in solving this problem) (01 mark)

2. Mean Annual Rainfall values in mm for Badulla from year 1992 to 2016 are 2490, 2755, 2005, 2315, 2220, 2130, 2020, 2220, 2105, 2705, 2550, 2490, 2035, 2220, 2295, 2265, 2490, 2610, 2550, 2345, 2670, 2785, 2075, 2490 and 2550 respectively.

a. Determine the 75% probability rainfall value in mm. (08 mark)
b. What is the rainfall value in mm that occurs once in 4 years? (03 mark)
c. What is the probability to have a rainfall of 2000 mm or above? (03 mark)
d. What is the probability to have a rainfall less than 2500 mm? (03 mark)
e. What is the recurrence interval of 2650 mm rainfall? (03 mark)

3.

a. Distances to an ungauged point from nearby three rainfall stations are 10 km, 20 km and 30 km. The recorded rainfalls of the three stations in a particular day are 30 mm, 20 mm and 10 mm respectively. Predict the rainfall at the ungauged point using the Inverse Distance Weighting (IDW) method. (05 mark)

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(100)

b. Recorded precipitations and corresponding Bi-sectional areas of Theissen polygon for seven rainfall stations are given in the table. Calculate the average precipitation over the basin using the Arithmetic Mean method and the Thiessen Polygon method. (05 mark)

Station No.	Precipitation (mm)	Corresponding Bi-sectional Area (km^2)
1	10	25
2	25	100
3	40	120
4	20	80
5	15	60
6	17	50
7	12	90

c. Area between the isohyets and the corresponding average precipitations are given in the table. Calculate the average precipitation over the basin using the Isohyetal method. (05 mark)

Isohyet (mm)	Area between Isohyets (km^2)	Corresponding Average Precipitation (mm)
>125	58.90	129
100 - 125	497.11	112.5
75 - 100	288.87	87.5
50 - 75	196.42	62.5
25 - 50	501.36	37.5
< 25	77.35	21

4.

a. What is meant by the 'normal rainfall' in hydrology? (03 mark)

b. The annual normal precipitation at stations A, B, C and D in a basin are 81.91, 72.24, 93.02 and 63.58 cm respectively. In the year 2016 the station D was inoperative and the stations A, B and C recorded annual precipitations of 92.11, 62.23 and 78.61 cm respectively. Estimate the precipitation at station D in that year. (07 mark)

c. A reservoir with a surface area of 260 ha had the following parameters: water temperature = 26°C, RH = 80.4 %, wind velocity at 9.0 m above the ground = 20 km/hr. Estimate the volume of the water evaporated from the reservoir in a week.

Given: Saturated vapor pressure (e_w) at 26°C = 25.22 mmHg, K_m coefficient of Mayer's Formula for large deep waters = 0.36. (10 mark)

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