國立成功大學

113學年度碩士班招生考試試題

編　號：156

系　　所：自然災害減災及管理國際碩士學位學程

科　　目：水文學

日　　期：0201

節　次：第 3 節

備　　註：不可使用計算機

※ 考生請注意：本試題不可使用計算機。　請於答案卷(卡)作答，於本試題紙上作答者，不予計分。

(1) Please explain the following terms

    (a) Hypothesis of **Unit Hydrograph**. [5 conditions] (5%)

    (b) The definition of **Time of Concentration** (t_c). (5%)

    (c) Please list five distributions that are commonly used in hydrology. (5%)

    (d) Rational Method. (5%)

    (e) Evapotranspiration. (5%)

* The calculation process is necessary

(2) Using the Inflow records in Table 1, calculate the outflow by using the Muskingum method if X=0.2, K=2 hour, Δt=1 hour, and the outflow in hour 1 (I_1) was 50 m³/s.

Table 1 Inflow records

Time (hour)	1	2	3	4
Inflow (m³/s)	50	80	120	210

    (a) Explain the hypothesis of the Muskingum method by drawing a diagram. (5%)

    (b) Derive the C_0, C_1, C_2 of Muskingum method. (10%)

$$C_0 = \frac{-KX + 0.5\Delta t}{K(1-X) + 0.5\Delta t}$$

$$C_1 = \frac{KX + 0.5\Delta t}{K(1-X) + 0.5\Delta t}$$

$$C_2 = \frac{K(1-X) - 0.5\Delta t}{K(1-X) + 0.5\Delta t}$$

$$O_2 = C_0 I_2 + C_1 I_1 + C_2 O_1$$

    (c) Calculating the outflow hydrograph of hours 2, 3, and 4. (10%)

(3) Using the derived **direct runoff hydrograph** in Table 2, determine the **1-hr unit hydrograph** for a 4-hr storm have the following rain in Table 3. Assuming the **Φ value (the constant infiltration capacity) is 1 cm/hr**.

Table 2 direct runoff hydrograph

Time(hr)	0	1	2	3	4	5	6	7	8	9	10	11
Runoff(cms)	0	6	23	50	88	112	97	61	30	11	2	0

Table 3 Storm raw rain records

Time(hr)	1	2	3	4	5
rainfall(cm)	3	4	2	1	0

(a) Calculating the effective rain. (5%)

(b) Calculating 1-hr unit hydrograph. (10%)?

(c) Calculating 2-hr unit hydrograph by using S-curve method. (10%)

(4) The relationship between the water level (H) and outflow (Q) of a reservoir is given in Table 4, and the inflow relationship is provided in Table 5. The storage capacity is defined as S = AH, where the area A = 4000 m². The calculation time step is Δt = 600 seconds. Using the Puls Reservoir Routing Method, calculate the outflow in the first 30 minutes, assuming the reservoir was initially empty. (25 %)

Table 4

Water Level H (m)	Outflow Q (cms)
0	0
1	5
2	10
3	30
4	40
5	65
6	70
7	80
8	90

Table 5

Time (min)	Inflow I (cms)
0	0
10	20
20	30
30	60
40	100
50	50
60	40
70	20
80	0