# 國立成功大學

# 112學年度碩士班招生考試試題

編　號：105

系　所：水利及海洋工程學系

科　目：水文學

日　期：0207

節　次：第 3 節

備　註：可使用計算機

※ 考生請注意：本試題可使用計算機。　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)　The purpose and process of **Frequency Analysis.** (1 purpose, 4 processes)　(5 points)

    (b)　Hypothesis of **Unit Hydrograph.** (5 conditions) (5 points)

    (c)　The definition of **Time of Concentration** ($t_c$).　(5 points)

    (d)　**Unconfined Aquifer** and **Confined Aquifer.**　(5 points)

    (e)　Please list **five distributions** that are commonly used in hydrology.　(5 points)

* The calculation process is necessary

(2)　In a basin, the peak discharge for return period of 40 years is 19.8 m³/s, and the peak discharge for return period of 2 years is 8.5 m³/s. Assume that the distribution conforms to Extreme Value Type I, please calculate

$$K_T = -\frac{\sqrt{6}}{\pi}\left[0.5772 + \ln\left(\ln\frac{T}{T-1}\right)\right]$$

    (a)　the peak discharge for return period of 100 years;　(10 points)

    (b)　if the area of the basin is 100 hectares ($10^4 m^2$), the time of concentration is 40 min, the runoff coefficient is 0.4. There was a storm with 100 min duration and 20 cm effective rainfall. What were the peak discharge and return period of the storm? Assume the distribution is the same as (a) (using the Rational Method) (15 points)

(3) Using the Inflow records in Table 1, calculating the outflow by using Muskingum Method, if X=0.2, K=2 day, Δt=1 day, and the outflow in day 1 was 54 m³/s.

Table 1 Inflow records

| Time(day) | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| Inflow(m³/s) | 54 | 80 | 121 | 198 | 237 |

(a) Explain the hypothesis of the Muskingum Method by drawing a diagram. (5 points)

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

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

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

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

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

(c) Calculating the outflow hydrograph of day 2, 3, 4 and 5. (10 points)

(4) Using the derived direct runoff hydrograph in Table 2, determine the 1-hr unit hydrograph for a 4-hr storm having 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 points)

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

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