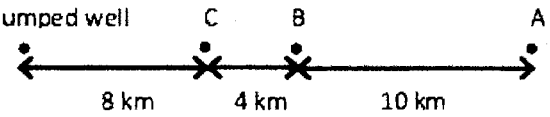
系所組別：水利及海洋工程學系甲組

考試科目：水文學 考試日期：0222，節次：1

※ 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. Hysteresis is dependence of a system not only of the present state but also of its past. Please explain:
   (1) Hysteresis in soil moisture. (10%)
   (2) Hysteresis in river discharge rating curves and the importance capturing it. (10%)

2. Groundwater makes up about 20 percent of the world's fresh water supply.
   (1) Please explain the safe yield of groundwater and state how we determine it. (10%)
   (2) A pumped well and three observation wells are located as the figure below shows. After pumping a while, some pollution was found to transport from observation well A to B for 20 hr. Please determine the time for the pollution to arrive observation well C from B. (10%)



3. Reservoir sedimentation is one of the frequent discussed issues recently. A reservoir is located in a watershed where the annual mean water inflow is $3*10^9$ m^3, the annual average bedload and suspended load are $1.25*10^6$ m^3 and $1*10^6$ m^3, respectively. The initial storage of the reservoir is $9*10^7$ m^3 and the trap efficiency can be derived from:

$$E_t = 1 - \frac{1}{1+100(C/I)}$$

   (1) Please explain suspended load, bedload, and trap efficiency. (9%)
   (2) Please determine the reservoir storage after use of 20 years. (10%)
   (3) Please determine the reservoir storage after use of 20 years if 30 % of the inflow sediment can be flushed through sluice gates annually. (6%)

4. Table 1 lists the incremental rainfall data of a storm in a 10-km^2 watershed. Table 2 shows the recorded discharge at the outlet of the watershed. Please:

Table 1

Time (hr)	0	2	4
Rainfall Intensity (cm/hr)	1.5	5	1

(背面仍有題目,請繼續作答)

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Table 2

Time (hr)	0	2	4	6	8	10	12	14	16	18	20	22
Q (cms)	7	6	12	28	20	15	10	6	5	4	4	4

(1) Plot the rainfall hyetopraph and find the total rainfall volume and rainfall intensity I_4 for 4-hr duration. (10%)

(2) Plot the discharge hydrograph and separate the direct runoff and baseflow on the plot. (8%)

(3) Determine the index Φ. (7%)

5. A 100-ha watershed has its runoff coefficient of 0.5 and the time of concentration of 20 min. Please:

(1) Estimate the peak discharge of a storm that generates 4 cm precipitation in a duration of 50 min. (5%)

(2) State what strategies can be taken to reduce the peak discharge. (5%)