

※ 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. After a storm event, Dr. Lo decided to check the streamflow data (watershed area: 30 km<sup>2</sup>) from Water Resources Agency website (Shown below).

Time (hour)	0	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	5.5	6.0	6.5	7.0
Streamflow (m <sup>3</sup> /s)	10	10	17	45	85	130	100	75	55	40	28	20	15	10	10
Rainfall (mm)			8		15		22		10		3				

He also found the infiltration rate (f) data from a report.

Time (hr)	2	6	∞
f (mm/hr)	6.218	2.453	1.500

- (a). Please estimate the  $\Phi$ -index. (8)
  - (b). Please estimate the potential cumulative infiltration depth (F) after 5 hours by using Horton equation. (10)
  - (c). So what is the real cumulative infiltration depth and please explain what the possible reasons are to make the differences between it and the result you got from (b). (4)
2. A 40 cm well fully penetrates an unconfined aquifer of 25 m depth. When the steady pumping discharge is 32 m<sup>3</sup>/min, two observation wells located 100 and 500 m from the pumped well are known to have drawdowns 2 and 1 m, respectively. If we enlarge the pumped well to 60 cm and the pumping discharge and drawdown of the pumping well remain the same, what is the influence radius of the new well? (15)
3. At a climate station, air pressure is measured as 100 kPa, air temperature as 26.5°C, and the wet-bulb or dew point temperature as 22°C. Please calculate the relative humidity and specific humidity. (10)
4. The mean ( $\mu$ ) of the yearly peak flow is 5000 cms and the standard deviation ( $\sigma$ ) is 2000 cms. If the yearly peak flow fits the Gumbel (EV1) distribution  $[P(x)=EXP(-EXP(-\alpha(X-\beta)))]$ ;  $\alpha=1.28/\sigma$ ;  $\beta=\mu-0.45\sigma$ .
- (a). Please determine the probability of flow exceeding 8000 cms in 20 years. (8)
  - (b). If the risk of the levee is 10% in 20 years, what is the designed peak flow of this levee? (10)
5. What are the "Flood Vulnerability" and its applications? (10)
6. Short answers (please explain what they are):
- (a). Sinuosity. (5)
  - (b). Stochastic process. (5)

7. The S-hydrograph tabulated below is generated from the 2 hour unit hydrograph:

Time (hr)	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	5.5
S Hydrograph (m <sup>3</sup> /s)	4	16	25	32	37	40.5	42.5	43.5	44	44	44

What is the direct runoff hydrograph (DRH) that would be observed from the following effective rainfall hyetograph (ERH)? (15)

Time (hr)	0~1.5	1.5~2.5
ERH (cm)	3	1