※ 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 difference between the two terms:
   (a). A hyetograph and a hydrograph. (6)
   (b). Hortonian overland flow and saturated overland flow. (8)

2. Short answers (please explain what they are)
   (a). Time of concentration. (5)
   (b). W-index. (5)

3. After a storm event, Dr. Lo decided to check the streamflow data (watershed area: 30 km^2) from Water Resources Agency website (Shown below).　Please estimate the Φ-index. (10)

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^3/s)	10	10	17	45	85	130	100	75	55	40	28	20	15	10	10
Rainfall (mm)			8		15		22		10		3				

4. Please draw A FIGURE to show a "3-order stream watershed" (put the order numbers next to the stream).　Then assign 4 rainfall gauge stations in this watershed and plot the Thiessen Polygon boundary for these four stations. Finally, show how to get the sinuosity. (12)

5. What is the "Flood Vulnerability" and its applications? (12)

6. A cofferdam has been built to protect a fruit farm area in Yu-Jing District, Tainan City until a major channel project can be completed.　The cofferdam was built for the 20-yr flood event.　The channel project will require 3 years to complete.　Hence, what are the probabilities that
   (a). The cofferdam will not be overtopped during the 3 years (the reliability)? (6)
   (b). The cofferdam will be overtopped exactly once in 3 years? (6)

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^3/s)	4	16	25	32	37	40.5	42.5	43.5	44	44	44

   (a). What is the watershed area? (6)
   (b). What is the direct runoff hydrograph (DRH) that would be observed from the following effective rainfall data? (24)

Time (hr)	0~1.5	1.5~2.5
Effective rainfall (cm)	3	1