編號： 175

國立成功大學 105 學年度碩士班招生考試試題

系　　所：自然災害減災及管理國際碩士學位學程

考試科目：統計學

考試日期：0227，節次：3

※ 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. (20%)

(1) (10%) Suppose a road is flooded with probability p during a year. What is the probability that the road will be flooded at least once during an n-year period?

(2) (10%) The level of the road is raised so that the probability that the road will be flooded (at least once) during an n-year period is q. What is the probability that the road will be flooded during a year?

2. (20%)

(1) (10%) The probability of receiving greater-than-50 mm rainfall of the year is $p_1, p_2, \ldots, p_{12}$ for January, February, …, December, respectively. What is the probability that a randomly selected monthly rainfall with greater-than-50 mm rainfall belongs to July?

(2) (10%) The demand of a water-supply system is classified as low, moderate, and high with known probabilities of l, m, and h. The conditional probabilities of system failure for low-, moderate-, and high-demand are a, b, and c, respectively. What is the probability that the demand is high given a system failure occurs?

3. (20%)

In a particular watershed there are m rainfall gauges, n of which are known to yield bad records. k ($n < k < m$) rainfall records are randomly selected from the m rainfall gauges.

(1) (10%) What is the probability that at least 1 bad record will be selected?

(2) (10%) What is the probability of selecting at least 2 bad records given that one of the recorded selected is bad?

4. (20%)

There are n paired observed data $(x_1, y_1), (x_2, y_2), \ldots, (x_n, y_n)$ which show a linear relationship. Suppose that the linear model $Y = a + b\,X$ can be used to model this linear relationship. Determine the coefficients of a and b using the least-squares method.

5. (20%)

(1) (10%) Show that the expectation of the Poisson distribution with parameter $\lambda > 0$, $f(x) = \frac{\lambda^x}{x!} e^{-\lambda}$, is λ.

(2) (10%) In a certain region severe storms occur at a rate of n storms per year. Assuming that the occurrences of severe storms can be modeled with the Poisson distribution. What is the probability of at most one sever storm occurred in any year?