※ 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%)

Given $P(A|B) = p$, $P(A|B') = q$, and $P(B) = r$, where $0 < p, q, r < 1$.

Determine (a) (10%) $P(B|A)$; and (b) (10%) $P(A' \cap B')$.

2. (20%)

Assume that occurrences of severe storms in a certain region can be modeled with the Poisson distribution. Given that severe storms occur at a rate of n storms per year.

Determine (a) (10%) average storms in a 5-year period; (b) (10%) the probability that at most one storm occurs in a 5-year period.

[Hint: Poisson distribution: $\dfrac{\lambda^x}{x!} e^{-\lambda}$]

3. (20%)

The probability that a bit transmitted through a digital transmission channel received in error is q, where $0 < q < 1$. Assume that the transmissions are independent events.

Determine (a) (10%) the probability that the first error requires at most 2 bits transmitted; and (b) (10%) the probability that 10 bits transmissions are required until the fourth error.

4. (20%)

Given a joint probability density function $f(x, y) = cxy$, $0 < x < 2$, $0 < y < x$.

(a) (10%) Determine the value of c; and (b) (10%) $E(X)$.

5. (20%)

The exponential distribution has a probability density function of $f(x) = \lambda e^{-\lambda x}$, $0 < x < \infty$.

Show that (a) (10%) $E(X) = \dfrac{1}{\lambda}$; and (b) (10%) $Var(X) = \dfrac{1}{\lambda^2}$.