國立中央大學八十七學年度轉學生入學試題卷

財務管理學系　三年級　　科目：統計學　　　　共 二 頁 第 / 頁

一、A laboratory blood test is 95 per cent effective in detecting a certain disease when it is, in fact, present. However, the test also yields a "false positive" result for 1 per cent of the healthy persons tested. (That is, if a healthy person is tested, then with probability .01, the test result will imply he has the disease.) If .5 per cent of the population actually has the disease, what is the probability a person has the disease given that his test result is positive? （ 10 points ）

二、Consider an experiment that consists of counting the number of α-particles given off in a 1-second interval by 1 gram of radioactive material. If we know from past experience that, on the average, 3.2 such α-particles are given off, what is a good approximation to the probability that no more than 2 α-particles will appear? （ 10 points ）

三、Suppose that X is a continuous random variable whose probability density function is given by

$$f(x)=\begin{cases} C(4x-2x^2) & 0<x<2 \\ 0 & \text{otherwise} \end{cases} \qquad \text{(10 points)}$$

1. What is the value of C?
2. Find $P\{X>1\}$.

四、Suppose that $p(x,y)$, the joint probability mass function of X and Y, is given by

$p(0,0)=.4 \qquad p(0,1)=.2 \qquad p(1,0)=.1 \qquad p(1,1)=.3$

Calculate the conditional probability mass function of X, given that Y=1. （ 10 points ）

五、Calculate $E[X]$ when X is binomially distributed, with parameters n and p. （ 10 points ）

六、Calculate the expectation of an exponentially distributed random variable having parameter λ. （ 10 points ）

七、Compute the variance of a binomial random variable X with parameters n and p. （ 10 points ）

八、Prove （ 30 points ）

1. $\operatorname{cov}(a+bX, c+dY)=bd\operatorname{cov}(X,Y)$
2. $\operatorname{cov}(X+Y,Z)=\operatorname{cov}(X,Z)+\operatorname{cov}(Y,Z)$.
3. $\operatorname{cov}(\sum_{1}^{n}X_i,\sum_{1}^{m}Y_j)=\sum_{j=1}^{m}\sum_{i=1}^{n}\operatorname{cov}(X_i,Y_j)$.