

國立交通大學 107 學年度碩士班考試入學招生試題

科目：統計學(4083)

考試日期：107 年 2 月 1 日 第 3 節

系所班別：統計學研究所 組別：統計所

第 / 頁, 共 / 頁

【不可使用計算機】\*作答前請先核對試題、答案卷(試卷)與准考證之所組別與考科是否相符!!

1. In order to estimate the probability of no customers arriving the shop in a day, a shop owner did the following: he observed the number of customers arriving the shop for  $n$  days and assumed these  $n$  observations are independent with common Poisson distribution.
  - (a) (15%) What is the maximum likelihood estimator of the probability of no customer arriving in a day?
  - (b) (15%) What is the uniformly minimum variance unbiased estimator of the probability of no customer arriving in a day?
  
2. (20%) A quality control engineer in a manufacturing unit found that the products had been reliable for a certain period of time, hence he assumed the life time of a product is exponentially distributed. How do you help him finding a 95% confidence interval for the mean life time of the product.
  
3. A genetic model suggests that the proportions of color blindness are different among men and women as the following: with some  $q = 1 - p$ , normal male, normal female, color-blinded male and color-blinded female are with proportions  $\frac{p}{2}$ ,  $\frac{p^2}{2} + pq$ ,  $\frac{q}{2}$ ,  $\frac{q^2}{2}$ , respectively. Suppose  $n$  individuals are observed and among which  $n_1, n_2, n_3, n_4$  are classified into four categories as above.
  - (a) (10%) Find the maximum likelihood estimator for  $p$ .
  - (b) (10%) Perform a size  $\alpha$  chi-square test to determine whether the model is consistent with the data.
  - (c) (10%) Perform a size  $\alpha$  chi-square test to determine whether color blindness is independent of sex.
  
4. (20%) Two different coins are tossed  $n$  and  $m$  times, respectively, to determine whether these two coins are identical in resulting head and tail. Perform an approximate size  $\alpha$  z-test.